JOHN J. TECKLENBURG
MAYOR

City of Charleston
South Carolina
Clerk of Council Department

VANESSA TURNER MAYBANK
CLERK OF COUNCIL

COMMITTEE ON RECREATION AND SUSTAINABILITY ADVISORY COMMITTEE

80 Broad Street
City Hall, Council Chamber
Monday, November 13, 2017
2:00 p.m.

AGENDA

1. Moment of Silence

2. Approval of Amendment IV to the 2001 Johnson Controls Energy Performance Contract for improvements to the energy and operational efficiency of City facilities. The scope of work includes improvements to 72 City facilities including but not limited to LED Interior Lighting Upgrades and Controls, Parking Garage Lighting Upgrades, R-22 Equipment Replacement, HVAC Building Controls Improvements, Chiller Replacements. Mechanical System Upgrades and Replacement, MLK New Pool Enclosure & Upgrades, Window Replacements at St. Julian Devine, and Distributed Energy Storage at Greenberg Municipal Complex. Approval of this contract gives the Mayor the authorization to enter into a Lease Purchase Agreement for approximately $12.3 million that will be funded through $17 million in cost avoidance over a 15 year term.

3. Adjournment

In accordance with the Americans with Disabilities Act, people who need alternative formats, ASL (American Sign Language) Interpretation or other accommodation please contact Janet Schumacher at (843) 577-1389 or email to schumacherj@charleston-sc.gov three business days prior to the meeting.

CONTRACT AMENDMENT – NUMBER FOUR

THIS CONTRACT AMENDMENT – Number Four to that certain Master Agreement between the City of Charleston, South Carolina ("Customer") and Johnson Controls, Inc. ("JCI") dated March 29, 2001 (the "Agreement") AND previous Contract Amendments – Number One (dated December 18, 2007), Number Two (dated September 9, 2008) and Number Three (dated September 9, 2008) which provides for the provision to Customer of various energy savings measures, performance contracting equipment and services provided by JCI (the "Project") is made and entered into this _____ day of October, 2017.

WHEREAS, the Agreement contemplated that the Project would be developed in phases, with different scope of working continuing to be developed over the term of the Agreement; and

WHEREAS, the work associated with Phase I and Phase II (Contract Amendments – Number One, Two, and Three) is complete and the third scope of work developed by the parties is now ready to begin ("Phase III"); and

WHEREAS, the parties wish to amend the Agreement to document the parameters of Phase III of the Project. The Assured Performance Guarantee for Phase III, Schedule 2-4, will provide additional savings to the existing amount of the Assured Performance Guarantee as reflected in Schedule 2-2, 2-2(A), and 2-3; and

WHEREAS, the parties wish to further amend the Agreement to document the parameters of Phase II of the Project and adjust the scope of work, payment terms, dates of commencement of work, substantial completion of the work and the term of the Agreement as reflected in Schedules 1-2, 1-2(A), 1-3, 2-2, 2-2(A), 2-3, 3-2, 3-2(A), 3-3 and 4-2, 4-2(A), 4-3 of the Agreement; and,

WHEREAS, the parties desire to further amend the Agreement to incorporate new Schedules 1-4, 2-4, 3-4, 4-4 therein which shall represent the scope of work and services to be performed by the parties for Phase III of the Project, such work and services to be subject to the terms and conditions of the Agreement.

NOW THEREFORE, in consideration of the mutual covenants, agreements and conditions herein contained and for other and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, Contractor and Customer agree to amend the contract as follows:

1. The Agreement shall be amended by adding the following schedules, identified herein below, said schedules being attached hereto and incorporated by reference herein:

Schedule 1-4 -	Scope of Work
Schedule 2-4 -	Assured Performance Guarantee
Schedule 3-4 -	Customer Responsibilities
Schedule 4-4 -	Price and Payment Terms
Attachment 4-	Preventative Maintenance Services Agreement
Attachment 5-	Change Order Form

2. The Agreement shall be further amended to provide that Schedule 1-4 shall form the basis for a new scope of work for Phase III of the Project, which shall supplement Schedule 1, Schedule 1-2, Schedule 1-2(A), and Schedule 1-3 contained in the Agreement and Contract Amendments – Number One, Number Two, and Number Three.

3. The Agreement shall be further amended to provide that Schedule 2-4 shall include the total amount of savings guaranteed under Phase III only. These savings will be in addition to the savings associated with the previous phases which shall supplement Schedule 2-2, 2-2(A), 2-3, 3 contained in the Agreement and Contract Amendments – Number One, Number Two, and Number Three.

4. The Agreement shall be further amended to provide that Schedule 3-4 establishes the customer and JCI's responsibilities in delivering the work included in Phase 3.

5. The Agreement shall be further amended to provide that Schedule 4-4 shall include the complete Lease/Purchase provisions governing JCI and Customer for Phase III only. Measurement and Verification (M&V) Services and Preventative Maintenance Services included in Schedule 4-4 include the complete services governing JCI and Customer for Phase I, Phase II (Contract Amendments Number One, Number Two, and Number Three) and Phase III of the Project and shall replace Schedule 3-2 which replaced Schedule 3 in the Agreement.

6. In signing this Contract Amendment – Number Four, the parties acknowledge that they have the authority to sign this Contract Amendment – Number Four, and that all necessary action has been taken to cause this Contract Amendment – Number Four to become legal, valid and binding on the parties.

7. The Agreement as amended by this Contract Amendment – Number Four represents the entire agreement between JCI and the Customer and supersedes any prior oral understandings, written agreements, proposals, or other communications between JCI and the Customer. Any subsequent amendment or modification to the Agreement as amended by this Contract Amendment – Number Four shall not be effective unless made in writing and signed by the parties hereto.

8. Except as modified or otherwise provided herein, the existing terms, covenants, agreements, responsibilities and obligations contained in the Agreement shall remain in full force and effect through the term of the Agreement as amended by this Contract Amendment – Number Four. In the event of conflict between the terms and conditions of the Agreement and the terms and conditions of this Contract Amendment – Number Four, the terms and conditions of this Contract Amendment – Number Four shall prevail.

This Contract Amendment – Number Four shall be effective upon the date of execution by both parties.

IN WITNESS WHEREOF, the parties have duly executed this Contract Amendment Number Four as the date set forth on page 1 hereof.

CITY OF CHARLESTON, SOUTH CAROLINA	**JOHNSON CONTROLS, INC.**
Signature:_____	Signature:_____
Printed Name:_____	Printed Name:_____
Title:_____	Title:_____
Date:_____	Date:_____

Scope of Work

ECM 1 - Interior Lighting Upgrades and Controls

This ECM will replace existing 28-watt / 32-watt T8, CFL, HID and high pressure sodium lighting and ballasts with high-efficiency long life LED lighting technology as detailed specifically in the Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line". The existing fixtures will be either retrofitted, relamped or replaced on a case-by-case basis as detailed specifically in the Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line". Wireless occupancy controls will also be installed in the select spaces with intermittent occupancy patterns to reduce lighting burn hours during the extended unoccupied periods as detailed specifically in the Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".

Vending machines will be retrofitted with VendingMiser[tm] controls as detailed specifically in the Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line". During the periods of limited occupant traffic, the VendingMiser[tm] controls will power down the machines and turn off the display lights to conserve energy. This will also result in reduced cooling load on the HVAC system serving the space.

Refer to detailed scope of work for this ECM in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".

Lighting Upgrades Scope Summary:

Facility	No Retrofit	Retrofit	Relamp	Retrofit With Kit/Reflector	New/ Replacement Fixture	Total Count
ANGEL OAK GIFT SHOP	0	11	0	0	0	11
ANGEL OAK GIFT SHOP - Exterior	2	0	4	0	0	6
ARCH BLDG - CIVIC DESIGN CENTER	12	0	35	0	0	47
ARCH BLDG - CIVIC DESIGN CENTER - Exterior	0	0	2	0	0	2
ARTHUR W. CHRISTOPHER COMMUNITY CENTER - Exterior	2	0	14	6	12	34
ARTHUR W. CHRISTOPHER COMMUNITY CENTER	16	113	0	6	26	161
BEE'S LANDING	113	82	2	33	33	263
BEE'S LANDING - Exterior	0	56	8	0	0	64
BOXING GYM - COMMUNITY CENTER	0	10	23	29	1	63
BOXING GYM - COMMUNITY CENTER - Exterior	0	0	0	0	4	4
CHARLESTON TENNIS	93	27	14	0	0	134
CHARLESTON TENNIS - Exterior	0	4	42	0	0	46
CITY ART GALLERY	146	23	25	0	1	195
CITY HALL - 80 BROAD ST	56	33	280	12	7	388
CITY HALL - 80 BROAD ST - Exterior	5	0	0	0	4	9
CITY OFFICES - 50 BROAD ST	7	56	24	0	0	87
DANIEL ISLAND MUNICIPAL BUILDING	11	55	6	69	0	141
DANIEL ISLAND MUNICIPAL BUILDING - Exterior	16	0	0	0	0	16
DEMING PLAYGROUND	0	24	0	0	2	26

Facility	No Retrofit	Retrofit	Relamp	Retrofit With Kit/Reflector	New/ Replacement Fixture	Total Count
DEMING PLAYGROUND - Exterior	0	0	0	0	6	6
DOCK ST THEATER	200	117	422	0	12	751
DOCK ST THEATER - Exterior	0	3	21	0	3	27
EASTSIDE COMMUNITY CENTER	10	93	78	0	0	181
EASTSIDE COMMUNITY CENTER - Exterior	0	0	0	0	16	16
FAMILY CIRCLE CLUBHOUSE	0	72	49	93	3	217
FAMILY CIRCLE CLUBHOUSE - Exterior	11	0	6	0	2	19
FINANCE - 112 MEETING PL.	4	129	0	9	11	153
FIRE STATION #10	1	32	1	0	0	34
FIRE STATION #10 - Exterior	0	6	6	0	0	12
FIRE STATION #12	0	21	6	0	0	27
FIRE STATION #12 - Exterior	0	2	2	0	0	4
FIRE STATION #13	3	28	0	0	0	31
FIRE STATION #13 - Exterior	2	0	3	2	0	7
FIRE STATION #16	0	24	24	13	0	61
FIRE STATION #16 - Exterior	1	2	4	0	0	7
FIRE STATION #17 (& POLICE)	26	47	14	66	0	153
FIRE STATION #17 (& POLICE) - Exterior	6	12	0	0	0	18
FIRE STATION #18	0	8	28	0	0	36
FIRE STATION #18 - Exterior	0	2	0	0	1	3
FIRE STATION #19	0	35	0	23	6	64
FIRE STATION #19 - Exterior	0	0	2	0	3	5
FIRE STATION #2 & 3 - Exterior	0	0	2	0	4	6
FIRE STATION #2 & 3	0	41	38	0	1	80
FIRE STATION #20	0	41	4	5	5	55
FIRE STATION #20 - Exterior	0	2	0	0	2	4
FIRE STATION #4 & 5	0	61	11	2	0	74
FIRE STATION #4 & 5 - Exterior	0	0	0	0	4	4
FIRE STATION #6	0	21	7	0	0	28
FIRE STATION #6 - Exterior	0	0	2	0	3	5
FIRE STATION #7	3	43	23	4	0	73
FIRE STATION #7 - Exterior	1	0	8	0	4	13
FIRE STATION #8	0	14	1	0	0	15
FIRE STATION #8 - Exterior	0	1	3	0	0	4
FIRE STATION #9	10	181	2	48	5	246
FIRE STATION #9 - Exterior	4	8	10	0	2	24
FIRE TOWER/ TRAINING	0	15	0	0	0	15
FIRE TOWER/ TRAINING - Exterior	0	2	0	0	0	2
FOREST PARK PLAYGROUND	0	0	22	3	0	25
FOREST PARK PLAYGROUND - Exterior	0	0	1	0	3	4
FREDDIE WHALEY COMMUNITY CENTER	0	47	5	22	0	74

Facility	No Retrofit	Retrofit	Relamp	Retrofit With Kit/Reflector	New/ Replacement Fixture	Total Count
FREDDIE WHALEY COMMUNITY CENTER - Exterior	0	0	0	0	3	3
GOLF CLUBHOUSE	11	63	3	0	0	77
GOLF CLUBHOUSE - Exterior	3	4	8	3	2	20
HAMPTON PARK - HORTICULTURE OFFICE	0	26	0	0	3	29
HAMPTON PARK - HORTICULTURE OFFICE - Exterior	0	0	2	0	0	2
HASSEL AQUATIC CENTER	30	10	0	175	0	215
HAZEL PARKER PLAYGROUND - Exterior	0	0	3	0	5	8
HAZEL PARKER PLAYGROUND	0	34	9	0	4	47
JACK ADAMS TENNIS CTR - RESTROOMS/SHELTER	0	7	3	0	0	10
JACK ADAMS TENNIS CTR - RESTROOMS/SHELTER - Exterior	0	0	2	0	2	4
JIRC GYMNASIUM	0	105	2	0	5	112
JIRC GYMNASIUM - Exterior	0	5	6	0	9	20
LENEVAR PARK	0	0	12	3	0	15
LOCKWOOD (GREENBURG) MUNICIPAL	18	112	11	505	8	654
LOCKWOOD (GREENBURG) MUNICIPAL - Exterior	31	29	0	2	6	68
LOCKWOOD (GREENBURG) MUNICIPAL - POLICE	11	579	54	64	7	715
LOCKWOOD (GREENBURG) MUNICIPAL - POLICE - Exterior	0	6	0	0	2	8
LOW COUNTY SENIOR CENTER	0	83	72	22	0	177
LOW COUNTY SENIOR CENTER - Exterior	0	9	16	0	4	29
MALL PARK	2	0	1	2	0	5
MALL PARK - Exterior	0	0	0	0	10	10
MARITIME CENTER	25	41	55	7	0	128
MARITIME CENTER - Exterior	0	19	8	0	3	30
MARTIN PARK REC CENTER	24	137	0	0	0	161
MARTIN PARK REC CENTER - Exterior	0	4	0	6	11	21
MARY UTSEY (ORANGE GROVE PARK)- PARK HOUSE	42	1	2	2	1	48
MARY UTSEY (ORANGE GROVE PARK)- PARK HOUSE - Exterior	0	0	0	0	4	4
MAYBANK TENNIS CENTER	79	9	5	0	0	93
MAYBANK TENNIS CENTER - Exterior	0	0	2	0	2	4
MCMAHON PLAYGROUND	42	1	2	2	1	48
MCMAHON PLAYGROUND - Exterior	0	0	0	0	4	4
MILFORD ST - LOGISTICS	47	46	5	25	47	170
MILFORD ST - LOGISTICS - Exterior	0	0	1	0	11	12
MITCHELL PLAYGROUND	0	7	0	0	0	7
MITCHELL PLAYGROUND - Exterior	1	0	2	0	0	3
MLK POOL	0	80	0	0	1	81
MLK POOL - Exterior	3	0	4	0	23	30
MOULTRIE PLAYGROUND	0	1	2	2	1	6
MOULTRIE PLAYGROUND - Exterior	0	0	0	0	2	2
OLD SLAVE MART	25	0	89	0	3	117

Facility	No Retrofit	Retrofit	Relamp	Retrofit With Kit/Reflector	New/ Replacement Fixture	Total Count
ORLEANS WOODS	0	24	0	0	2	26
ORLEANS WOODS - Exterior	0	0	0	0	6	6
PARKS BUILDING	15	280	17	88	0	400
PARKS WAREHOUSE	2	17	0	9	13	41
PARKS WAREHOUSE - Exterior	0	5	1	0	10	16
POLICE - OFFICE	0	137	38	18	6	199
POLICE - OFFICE - Exterior	0	2	0	0	0	2
POLICE SUB STATION	0	47	0	4	0	51
POLICE SUB STATION - Exterior	0	0	0	0	2	2
PUBLIC SERVICE COMPOUND	2	165	0	5	35	207
PUBLIC SERVICE COMPOUND - Exterior	6	0	0	0	11	17
RILEY BASEBALL STADIUM	198	539	112	0	3	852
RILEY BASEBALL STADIUM - Exterior	13	28	70	8	26	145
SHAW CENTER	0	57	3	40	27	127
SHAW CENTER - Exterior	0	0	6	2	4	12
THOMAS JOHNSON PARK (WESTCHESTER PARK)	0	24	0	0	2	26
THOMAS JOHNSON PARK (WESTCHESTER PARK) - Exterior	0	2	0	0	6	8
TIEDEMAN PARK	0	0	22	3	0	25
TIEDEMAN PARK - Exterior	0	0	1	0	4	5
VISITOR CENTER - Exterior	26	34	51	0	0	111
VISITOR CENTER	7	23	208	14	0	252
VOLVO TENNIS STADIUM	220	78	0	0	1	299
VOLVO TENNIS STADIUM - Exterior	4	54	43	0	41	142
WL STEPHENS - Exterior	19	3	3	0	10	35
WL STEPHENS	21	47	3	0	4	75

Demolition and Removal Work shall include the following:

- Cover exposed desks, computers and office equipment during the installation.
- Install lockout/tagout on the lighting circuits as required.
- Safely disconnect electrical supply to the lighting circuits as required.
- Disconnect and remove existing lamps, ballasts and fixtures.
- Store used lamps and ballasts in clearly marked containers.
- Properly dispose of lamps and ballasts as per the applicable codes.
- Properly dispose of all removed equipment and waste materials.
- Clean-up at the end of each shift with vacuuming, dusting and trash removal.

New Installation Work shall include the following:

- Furnish and install new lighting components as listed in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Clean prismatic lenses with a rag where applicable.
- Furnish and install new wireless occupancy sensors in the specified spaces as listed in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Properly adjust sensitivity of the new occupancy sensors.
- Install VendingMisers[tm] on select vending machines as identified in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Remove lockout/tagout from the lighting circuits if applicable.
- Safely restore electrical supply to the lighting circuits.
- Startup, checkout and verify full range of operation and control features per manufacturers' startup and checkout procedures.
- Clean up of all job related debris daily. Clean up and store tools, equipment, etc. daily and remove after successful installation and operational checkout.

ECM 2 - Parking Garage Lighting Upgrades

This ECM will replace specified existing older HID or LED lighting with high-efficiency long life LED lighting technology with WIFI enabled lighting controls. The new fixtures shall be equipped with embedded WIFI enabled lighting controls to enable flexible control strategies.

Refer to detailed scope of work for this ECM in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".

Lighting Upgrades Scope Summary:

Facility	No Retrofit	Retrofit	Relamp	Retrofit With Kit/Reflector	New/ Replacement Fixture	Total Count
AQUARIUM PARKING GARAGE	27	100	0	0	0	127
AQUARIUM PARKING GARAGE - Exterior	0	367	0	0	0	367
CAMDEN EXCHANGE PARKING GARAGE - Exterior	8	0	0	0	0	8
CAMDEN EXCHANGE PARKING GARAGE	2	8	0	0	38	48
CHARLESTON PL. PARKING GARAGE (85 HASSELL) - Exterior	19	0	0	0	6	25
CHARLESTON PL. PARKING GARAGE (85 HASSELL)	25	27	1	0	1	54
CONCORD PARKING GARAGE	10	11	0	0	0	21
CONCORD PARKING GARAGE - Exterior	8	0	0	0	6	14
GAILLARD PARKING GARAGE - Exterior	24	8	0	0	0	32
GAILLARD PARKING GARAGE	0	158	0	0	0	158
MAJESTIC SQ. PARKING GARAGE - Exterior	14	0	0	0	0	14
MAJESTIC SQ. PARKING GARAGE	3	19	0	0	1	23

Facility	No Retrofit	Retrofit	Relamp	Retrofit With Kit/Reflector	New/ Replacement Fixture	Total Count
MARION SQ. PARKING GARAGE - Exterior	22	0	0	0	0	22
MARION SQ. PARKING GARAGE	51	78	3	23	7	162
PRIOLEAU & EAST BAY PARKING GARAGE - Exterior	7	0	0	0	8	15
PRIOLEAU & EAST BAY PARKING GARAGE	27	23	0	0	0	50
QUEEN ST PARKING GARAGE - Exterior	0	0	2	0	14	16
QUEEN ST PARKING GARAGE	3	143	0	0	83	229
ST. PHILLIPS PARKING GARAGE - Exterior	20	0	0	0	0	20
ST. PHILLIPS PARKING GARAGE	35	51	0	4	0	90
VTRC PARKING GARAGE - Exterior	0	161	50	0	16	227
VTRC PARKING GARAGE	0	92	0	1	4	97
QUEEN ST PARKING GARAGE (New LED Canopies)	0	0	0	0	89	89

Demolition and Removal Work shall include the following:

- Install lockout/tagout on the lighting circuits as required.
- Safely disconnect electrical supply to the lighting circuits as required.
- Disconnect and remove existing lamps, ballasts and fixtures.
- Store used lamps and ballasts in clearly marked containers.
- Properly dispose lamps, ballasts and fixtures as per the applicable codes.
- Properly dispose of all removed equipment and waste materials.

New Installation Work shall include the following:

- Furnish and install new lighting components as listed in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Remove lockout/tagout from the lighting circuits if applicable.
- Safely restore electrical supply to the lighting circuits.
- Startup, checkout and verify full range of operation and control features per manufacturers' startup and checkout procedures.
- Clean up of all job related debris daily. Clean up and store tools, equipment, etc. daily and remove after successful installation and operational checkout.

Inclusions, Exclusions and Assumptions applicable to ECM 1 and ECM 2:

Inclusions:

- Pricing is turnkey which includes material, labor, engineering, design and disposal costs.
- Recycling of lamps and ballasts in compliance with regulations.

- New work completed in accordance with industry standards and approved safety practices by licensed, insured and certified personnel skilled in lighting retrofit services.
- Average foot-candle levels shall be as defined by Illuminating Engineering Society.
- All work performed during first or second shift, 40 hour work week, Monday through Friday; weekends or overtime not included.
- 100% access will be granted to all facilities during the construction schedule. Keys, escort and security clearance will be provided in a timely manner.
- All circuit breakers, contactors and switches are assumed to be operational.
- JCI shall be given ample notice for security clearance procedures required for access to any facility included in the scope of work.
- Foot-candle levels shall be measured by procedures recommended by the Illuminating Engineering Society, using a calibrated light meter.
- In the absence of code-mandated foot-candle requirements, we will use industry standards, primarily the most recent edition of the Illuminating Engineering Society (IES) Lighting Handbook 10th Edition, IES Recommended Practice documents and IES Design Guides.
- If specified materials become either temporarily or permanently unavailable for reasons beyond the control of JCI, then the expected time for performance of the work will be extended to the extent of unavailability and we reserve the right to provide equivalent substitutions at no price increase.
- Wiping down prismatic lenses with dry cloth.
- Labor Warranty – 1 year workmanship guarantee which will begin after acceptance of each Facility Improvement Measure in each individual building addressed in the scope.
- Manufacturer warranties of lamps, ballasts and fixtures installed are covered by the published policies of individual manufacturers. JCI will furnish contact information for each manufacturer. Alleged defective product may be required for return to factory for analysis.
- Repair or replacement of yellowed, cracked, damaged or missing fixture lenses (not to exceed 100 pcs.).
- Sales Tax.

Exclusions:

- Electrical permits and fees
- Existing task lighting and table type light fixtures.
- Removal or replacement of ceiling tiles unless specified by customer or scope.
- Work in Asbestos contaminated areas.
- Existing decorative light fixtures except those noted on the provided line by line documents, Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".

- The addition of lighting fixtures in "under-lighted" areas not covered under this scope of work unless noted in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- If foot-candle levels do not meet minimum standards, the customer will be notified.
- Existing fluorescent dimming systems will remain "as is" unless otherwise noted in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Reconfiguration of existing fixture layout unless otherwise noted in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Replace of the existing lighting sockets unless otherwise noted in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Replacement of existing wiring and/or electrical issues in exterior fixtures.
- Existing fixtures with dimming controls unless provided for in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Repair or replacement of existing fixtures which are rusted or embrittled in a manner which would impede retrofit.
- Correction or repair of electrical system deficiencies.
- Correction of any existing applicable building code violations
- Conformance to IEEE standards if the existing layout does not comply with same
- Any electrical wiring other than that required for ballast replacement within the existing lighting fixtures, the installation on new fixtures as scheduled, the installation of occupancy sensors and other controls.
- Double or bi-level switching of in-board and out-board sockets is not included unless specified in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Repair, replacement and adjustments of existing sensors, time clocks, switches or energy management systems unless otherwise noted.
- Calibration or adjustment of the lighting control devices post installation. JCI will set controls to the agreed upon settings at time of installation only.
- Painting, plastering or any other type of repair to existing mounting surfaces after the removal or replacement of fixtures, unless otherwise noted in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Repair, replacement or upgrades to the Emergency or Egress Lighting Systems unless otherwise noted in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Replacement of defective emergency battery back-up ballast unless otherwise noted in Exhibit 1, ECM 1 & 2, "Lighting Line-by-Line".
- Situations that could not be documented during the audit i.e. concealed or inaccessible locations.

ECM 3a - HVAC Building Controls Improvements

Replace existing standalone HVAC system thermostats with new wireless networked programmable thermostats as listed in the table below:

FACILITY NAME	NUMBER OF UNITS	UNIT TYPE
HAZEL PARKER PLAYGROUND	2	SPLIT SYSTEM
MOULTRIE PLAYGROUND	1	SPLIT SYSTEM
TIEDEMAN PARK	1	SPLIT SYSTEM
MALL PARK	1	SPLIT SYSTEM
MCMAHON PLAYGROUND	1	SPLIT SYSTEM
HAMPTON PARK - HORTICULTURE OFFICE	2	SPLIT SYSTEM
FREDDIE WHALEY COMMUNITY CENTER	1	SPLIT SYSTEM
MITCHELL PLAYGROUND	1	SPLIT SYSTEM
MARTIN PARK	1	SPLIT SYSTEM
THOMAS JOHNSON Park (WESTCHESTER PARK)	1	SPLIT SYSTEM
DEMING PLAYGROUND	1	SPLIT SYSTEM
FOREST PARK PLAYGROUND	1	SPLIT SYSTEM
LENEVAR PARK	1	SPLIT SYSTEM
MARY UTSEY (ORANGE GROVE PARK) - PARK HOUSE	1	SPLIT SYSTEM
ORLEANS WOODS (WILLIE GAINS)	1	SPLIT SYSTEM
MILFORD ST CITY STORES (LOGISTICS)	5	SPLIT SYSTEM
PUBLIC SERVICE COMPOUND - CITY GARAGE	8	SPLIT SYSTEM

Demolition and Removal Work

- Remove and dispose existing standalone thermostats.

New Installation Work

- Furnish and install one new wireless networked programmable thermostat per split system unit as listed in the above table.
- Furnish and install one new wireless network coordinator (WNC) gateway per facility as listed in the above table
- Furnish and install power supply for the new WNC gateway.
- Implement scheduling and program occupied/unoccupied temperature setpoints.
- Start up and check out.
- Furnish and install control items in the following point list:

Points List

Point	Notes
Occupancy mode (Occupied/Unoccupied)	Trend every 15 minutes
Operating mode (Heating/Cooling)	Trend every 15 minutes
Supply fan command (Start/Stop/Cycle)	Trend every 15 minutes
Zone temperature with display/set point/temporary occupancy	Trend every 15 minutes

Sequence of Operation

Supply fan control: the supply fan will be started based on occupancy schedule and the optimal start control routine.

Warmup/cooldown mode: the warmup/cooldown mode will be initiated by the network input. The unit will control to occupied set points during warmup and cooldown cycles.

Occupied mode: the occupancy mode will be controlled via a network input. The occupancy mode can also be overridden by a network input or a temporary occupancy sensor on the zone temperature sensor. The duration of the temporary occupancy mode will be set at 30mins per activation. The unit fan will run continuously to maintain occupied period temperature setpoint.

Unoccupied mode: the unit fan will cycle to maintain adjustable unoccupied zone set points during unoccupied periods.

Power fail restart: upon power restoration, the unit restart shall be delayed.

ECM 3b - HVAC Building Controls Fire Stations

Replace existing standalone HVAC system thermostats with new wireless networked programmable thermostats, as listed in the table below:

FACILITY NAME	NUMBER OF UNITS	UNIT TYPE
FIRE STATION 2 & 3 - OFFICE	3	SPLIT SYSTEM
FIRE STATION 6	2	SPLIT SYSTEM
FIRE STATION 7	2	SPLIT SYSTEM
FIRE STATION 8	2	SPLIT SYSTEM
FIRE STATION 10	3	SPLIT SYSTEM
FIRE STATION 12	3	SPLIT SYSTEM
FIRE STATION 13	2	(1) SPLIT SYSTEM & (1) RTU
FIRE STATION 4 & 15	4	SPLIT SYSTEM

FACILITY NAME	NUMBER OF UNITS	UNIT TYPE
FIRE STATION 16	2	SPLIT SYSTEM
FIRE STATION 17	2	SPLIT SYSTEM
DANIEL ISLAND POLICE/FIRE – FIRE STATION 18	6	SPLIT SYSTEM
FIRE STATION 19	2	SPLIT SYSTEM
FIRE STATION 20	1	SPLIT SYSTEM
FIRE TOWER - TRAINING FACILITY	7	(4) PTAC & (3) BARD

Demolition and Removal Work

- Remove & dispose existing standalone thermostats.

New Installation Work

- Furnish and install one new wireless networked programmable thermostat per unit as listed in the above table.
- Furnish and install duct sensor in return air duct. Space temperature shall be monitored from the return duct sensor as to accurately measure space conditions.
- Furnish and install one new wireless network coordinator (WNC) gateway per facility as listed in the above table
- Furnish and install power supply for the new WNC gateway.
- Program occupied/unoccupied temperature setpoints.
- Start up and check out.
- Furnish and install control items in the following point list:

Points List

Point	Notes
Occupancy mode (Occupied/Unoccupied)	Trend every 15 minutes
Operating mode (Heating/Cooling)	Trend every 15 minutes
Supply fan command (Start/Stop/Cycle)	Trend every 15 minutes
Return air temperature with display/set point/temporary occupancy	Trend every 15 minutes

Sequence of Operation

Occupied mode: the unit fan will run continuously.

Unoccupied mode: the unit fan will cycle to maintain adjustable zone set points during unoccupied periods.

Power fail restart: upon power restoration, the unit restart shall be delayed.

Inclusions and Exclusions Applicable to ECM 3a and ECM 3b

Inclusions:

- Graphics on the existing Metasys front end.
- Existing field devices will be reused where possible.
- Pre- and post-installation measurement and verification. Refer to M&V Plan Section for specific M&V activity.
- Detailed documentation in a mutually acceptable format.

Exclusions:

- Ethernet drops will be provided by the owner at each facility.
- Repair or replacement of defective mechanical, electrical and/or controls equipment, other than the equipment specifically described in the above-mentioned scope of work. Johnson Controls will identify the location of defective equipment and notify the owner.
- Repair or upgrades required to bring the HVAC, electrical and mechanical systems up to code.
- Test and balance of the existing HVAC and mechanical systems and terminal units, unless specified in the scope of work.
- Existing building ventilation conditions and indoor air quality issues (if any, except where it is was discussed with the owner during development of project and noted in scope) are excluded from the scope and cost of this project.
- Resolution of existing design, service, and or distribution conditions known or unknown

ECM 4 - R22 Equipment Replacement

The refrigerant known as R22 has been banned due to its ozone depleting chemicals and is currently in the process of being phased out in accordance with the timetable established in the Montreal Protocol. This measure is being taken to replace the City of Charleston's equipment currently operating on R22 with newer, more efficient equipment that uses a more environmentally friendly refrigerant. Equipment being replaced includes existing split system or packaged roof-top air-cooled air-conditioning equipment with new higher-efficiency equipment as listed in the table below:

Building	Unit Tag	Location	Area/Equip Served	Make	Existing Model#	Existing Serial#	Age	Tons	Existing EER	Proposed EER
PARKS DEPARTMENT	CU-1	ROOF	1ST FLOOR, AHU LOCATED ABOVE THE CEILING	FRASER-JOHNSTONH	EA8D-F036SB	W0A7379529	10	3	10.1	12.8
PARKS DEPARTMENT	CU-2	ROOF	1ST FLOOR, AHU LOCATED ABOVE THE CEILING	YORK	E1FH030S06A	EADM034709	22	2.5	7.8	13
PARKS DEPARTMENT	CU-S	ROOF	1ST FLOOR, AHU LOCATED ABOVE THE CEILING	INTERNATIONAL COMFORT PRODUCTS	R2H324GKR400	X143160794	3	2	10.8	13
PARKS DEPARTMENT	RTU-7	ROOF	2ND FLOOR	YORK	B4HP024A06B	N0G8118820	9	2	9.8	12.8
PARKS DEPARTMENT	RTU-8	ROOF	2ND FLOOR	YORK	B1HA048A25B	N0B5556510	12	4	6.8	12.8
PARKS DEPARTMENT	RTU-9	ROOF	2ND FLOOR	YORK	B1HA042A25B	N0B5607989	12	3.5	6.8	12.8
PARKS DEPARTMENT	RTU-10	ROOF	2ND FLOOR	YORK	B1HA042A25B	N0B5607990	12	3.5	6.8	12.8
PARKS DEPARTMENT	RTU-11	ROOF	2ND FLOOR	YORK	B1HA048A25B	N0B5556504	12	4	6.8	12.8
PARKS DEPARTMENT	RTU-12	ROOF	2ND FLOOR	YORK	B3HP036A06A	N0G8079068	9	3	9.3	12.8
PARKS DEPARTMENT	RTU-13	ROOF	2ND FLOOR	YORK	BAUA-F024AB	NBNM012446	13	2	6.8	12.8
PARKS DEPARTMENT	RTU-14	ROOF	2ND FLOOR	YORK	B3HP060A25A	N0G8075343	9	5	9.3	12.8
PARKS DEPARTMENT	RTU-15	ROOF	2ND FLOOR	YORK	B3HP030A06A	N0G8126464	9	2.5	9.3	12.8
OLD SLAVE MART	RTU-1	ROOF		TEMPSTAR	PGF048K120A	L010761502	16	4	6.8	12.8
OLD SLAVE MART	RTU-2	ROOF		TEMPSTAR	PGF024K060A	L010394813	16	2	6.8	12.8
OLD SLAVE MART	RTU-3	ROOF		TEMPSTAR	PGF036K100A	L01088883	16	3	6.8	12.8
SHAW CENTER	RTU-3	ROOF		CARRIER	50HJQ006--521--	0709G20366	10	5	10.1	12.8
LOWCOUNTRY SENIOR CENTER	CU-3		AH-3	TRANE	2TWB3060A1000CA	13082NHB4F	4	5	10.6	12.8
LOWCOUNTRY SENIOR CENTER	CU-4		AH-4	HEIL	R2H360GKR400	X141474941	3	5	10.8	12.8
LOWCOUNTRY SENIOR CENTER	CU-5		AH-5	TRANE	TWR036D100A0	Z1854YT4F	12	3	7.3	12.8
LOWCOUNTRY SENIOR CENTER	CU-8		AH-8	TRANE	TWR048D100A1	Z5053AW3F	16	4	7.3	12.5
CITY ART GALLERY	CU-1	ROOF		INTERNATIONAL COMFORT PRODUCTS	R2A360GHR200	X142671744	3	5	10.8	12.8
CITY ART GALLERY	CU-2	ROOF		GOODMAN	GSC130603CA	1303073436	4	5	10.7	12

Building	Unit Tag	Location	Area/Equip Served	Make	Existing Model#	Existing Serial#	Age	Tons	Existing EER	Proposed EER
CITY ART GALLERY	CU-3	ROOF		GOODMAN	GSC130603CA	1304152008	4	5	10.7	12
CITY ART GALLERY	CU-4	ROOF		INTERNATIONAL COMFORT PRODUCTS	R2A360GHR200	X142671730	3	5	10.8	12.8
CHARLESTON MARITIME CENTER	CU-1	NEXT TO ICE MACHINES	AH-1	THERMAL ZONE	TPZA-348-2C757	W251407889	3	4	10.8	12.5
CHARLESTON MARITIME CENTER	CU-2	NEXT TO ICE MACHINES	AH-2	TRANE XE 1000	TWR048C100A3	M0336EACF	20	4	7.3	12.5
CHARLESTON MARITIME CENTER	CU-4	NEXT TO ICE MACHINES	AH-4	TRANE	TWA060C400A2	L39320MFF	21	5	6.8	11.8
CHARLESTON MARITIME CENTER	CU-5	NEXT TO ICE MACHINES	AH-5	DAYTON	HP060X1341A	W0M7433638	10	5	10.1	12.3
CHARLESTON MARITIME CENTER	CU-6	NEXT TO ICE MACHINES	AH-6	DAYTON	HP060X1341A	W0H8228063	9	5	9.3	11.8
ST JULIAN DEVINE	CU-1	GROUND	2ND FLOOR OFFICE	TRANE	TWA090A400FB	7023KRKAD	10	7.5	8.3	11
ST JULIAN DEVINE	CU-2	GROUND	ART ROOM	TRANE	2TWB3060A1000AA	7015RSU2F	10	5	9.9	12
ST JULIAN DEVINE	CU-3	GROUND	RECREATION ROOM	TRANE	2TWB3060A1000AA	7021LNC2F	10	5	9.9	12.3
BEES LANDING RECREATION CENTER	HP-1	ROOF	AH-1	TRANE	TWA240B400FC	8182627AD	9	20	7.8	12.3
BEES LANDING RECREATION CENTER	HP-2	ROOF	AH-2	TRANE	TWA240B400FC	8145GTKAD	9	20	7.8	12.3
BEES LANDING RECREATION CENTER	RTHP-2	ROOF			PICTURE NOT CLEAR	PICTURE NOT CLEAR	NAMEPLATE DATA NOT AVAILABLE	3	6.8	12.8
BEES LANDING RECREATION CENTER	RTHP-1	ROOF		TRANE	WSC072A4RCA050Q	83210012GL	9	6	8.8	11.7
BEES LANDING RECREATION CENTER	RTHP-4	ROOF		TRANE	WSC090A4RCA06Q1	83510146--	9	7.5	8.4	11.4
BEES LANDING RECREATION CENTER	RTHP-5	ROOF		TRANE	WSC090A4RCA2MD 000A1	835101458L	9	7.5	8.4	11.4
FIRE STATION 17	CU-1	GROUND		YORK	E1RA048S06C	EFCH182261	23	4	7	12.5
FIRE STATION 17	CU-2	GROUND		PAYNE	PH10JA060-G	4505X62588	12	5	6.6	12
JIRC GYM	CU-1	GROUND	AHU SUSPENDED IN THE MAIN GYM	YORK	E1FB180A25B	N0K6919806	11	15	6.4	11.5

Building	Unit Tag	Location	Area/Equip Served	Make	Existing Model#	Existing Serial#	Age	Tons	Existing EER	Proposed EER
JIRC GYM	CU-3	GROUND	AHU ABOVE THE CEILING IN CHILD CARE ROOM	YORK	E2HB0365S06A	MDYM150023	NAMEPLATE DATA NOT AVAILABLE	3	8.7	12.5
JIRC GYM	RTU-1	GROUND	GYMNASTICS GYM	JOHNSON CONTROLS	T23FC02A2IANCIA	N0F8917500	9	30	7.9	10.5
JIRC GYM	CU-7	GROUND	AHU ABOVE THE CEILING IN THE HALLWAY	CARRIER	PH13NR030	0507X67607	12	2.5	8.1	13
JIRC GYM	CU-5	GROUND	AHU SUSPENDED IN THE MAIN GYM	YORK	E1FB180A25B	N0K6919806	11	15	6.4	11.5
FIRE STATION 2&3 OFFICE	CU-1	GROUND		INTERNATIONAL COMFORT PRODUCTS	R2A360GKR200	X142870808	3	3	10.8	12.8
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	CU-1	GROUND		CARRIER	38YCC060540	4900E14786	17	5	6.8	11.8
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	CU-2	GROUND		CARRIER	38AQS008---501--	0201G00117	16	7.5	7.2	12.5
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	CU-3	GROUND		CARRIER	38YCC036530	4700E15759	17	3	6.8	12.8
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	CU-4	GROUND		CARRIER	38YCC042550	5100E17224	17	3.5	6.8	12.8
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	CU-6	GROUND		CARRIER	38YCC048520	4300E13667	17	4	6.8	12.5
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	CU-7	GROUND		CARRIER	38YCC048520	4300E13646	17	4	6.8	12.5

Building	Unit Tag	Location	Area/Equip Served	Make	Existing Model#	Existing Serial#	Age	Tons	Existing EER	Proposed EER
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	CU-8	GROUND		CARRIER	38YCC030500	4700E15989	17	2.5	6.8	13
GOVERNORS PARK - FAMILY CIRCLE TENNIS CENTER	Bard Unit	Wall		Marv-Air				3.5		
FIRE STATION 18	HP-1	ROOF	AH-1	TRANE	TWA090A300FA	4233TMYAD	13	7.5	7.4	11
FIRE STATION 18	HP-2	ROOF	AH-2	TRANE	2TWR2048A1000BA	4222PE92F	13	4	7.8	12.5
FIRE STATION 18	HP-3	ROOF	AH-3	TRANE	2TWR2060A1000AB	4241KUB2F	13	5	7.8	12
FIRE STATION 18	HP-5	ROOF	AH-5	TRANE	2TWR2048A1000BA	4222PNE2F	13	4	7.8	12.5
FIRE STATION 4 & 15	CU-2	OUTSIDE WALL		INTERNATIONAL COMFORT PRODUCTS	R2A360GKR200	X133456822	4	5	10.7	12
FIRE STATION 4 & 15	CU-4	GROUND		UNITARY PRODUCTS GROUP	AC030X1322A	W0G6710748	11	2.5	8.2	13
FIRE TOWER - TRAINING FACILITY	BARD	WALL	TRAILER 1A	BARD	WA372-A10	225P05212B169-02	12	3	6.6	12.3
FIRE TOWER - TRAINING FACILITY	BARD	WALL	TRAILER 4	BARD	WA361-A10	125H011644700-01	16	3	6.6	12.3
FIRE TOWER - TRAINING FACILITY	BARD	WALL	GREY CONTAINER	BARD	WA121A05XX4XXX	158B082459041-01	9	1	7.5	12.3
MILFORD ST CITY STORES (LOGISTICS)	CU-5		OFFICE AREA IN THE SIGN SHOP				NAMEPLATE DATA NOT AVAILABLE	5	8.1	12.3

Demolition and Removal Work

- Recover and properly dispose of refrigerant as per the applicable codes.
- Remove each existing equipment electrical disconnect, and safely disconnect electrical supply.
- Disconnect equipment from existing ducting, condensate drain piping, and natural gas piping.
- Disconnect and secure thermostat connections as necessary to perform work.

- Remove and dispose of existing HVAC equipment as listed in the table above.
- Properly dispose of removed equipment and waste materials.

New Installation Work

- Furnish and install new HVAC equipment as listed in the table above at existing locations.
- Provide new curb adapters and supports if required for the HVAC units located on the roof.
- Provide new curb flashing and sealing of roof penetrations related to this work, if required.
- Reuse existing concrete pad or provide new concrete pad for the HVAC units mounted on the ground if the new equipment will not fit on the existing pad.
- Equipment supports to be compliant with local seismic and hurricane regulations.
- Provide electrical connections, with new electrical disconnect.
- Modify electrical power wiring distribution panel as needed. Existing electrical wiring will be reused as much as possible.
- Reconnect new equipment to existing ductwork reusing existing roof penetrations. If required, provide transition ductwork. Insulate any new ductwork.
- Reconnect new equipment to existing condensate drain and natural gas piping.
- Startup, checkout and verify full range of operation and control features per manufacturers' startup and checkout procedures.
- Clean up of all job related debris daily. Clean up and store tools, equipment, etc. daily and remove after successful installation and operational checkout.
- Reconnect new equipment to BAS or existing thermostat.
- Reclaimed R-22 refrigerant. Johnson Controls will provide approximately 30 lbs (3 containers) to the city for their use throughout the facilities. Reclaim/recycle certificates shall be provided to the city for all reclaimed R-22.

ECM 5a - Ground Loop Improvements - City Hall

The ground coupled heat transfer system currently serving City Hall has been unable to maintain the temperatures in the condenser water loop in the ranges specified by the equipment manufacturer. This measure is included to address the existing system deficiencies thereby increasing the system efficiency and improving the conditions placed on the existing equipment.

- Replace existing 30-ton water-to-water heat pump R-22 chiller (C1) with a new 30-ton high efficiency water-to-water R-410A chiller.
- Replace existing air-cooled liquid cooler currently serving the chiller loop and connect water source heat pump loops 2 & 3 to the new liquid cooler with new circulating pumps to reduce the condenser water temperatures and thereby improve the efficiency and extend the life of the water source heat pumps.
- Add one new liquid cooler for the remaining water source heat pump loop (Loop 1).

BUILDING	EQUIP TAG	LOCATION	AREA/EQUIP SERVED	MAKE	MODEL#	SERIAL#	DATE OF MANUFACTURING	DETAILS
CITY HALL	C1	MECHANICAL ROOM	AHU-1,2&3 SERVING THE COUNCIL CHAMBER	VERSATEC	VL360W3B8C0RBSSC	VK1890	11/1/2006	R-22, WATER SOURCE CHILLER
CITY HALL		OUTSIDE ON THE GROUND	CHILLER C1	MCQUAY	BFH035	T11C13302		AIR COOLED LIQUID COOLER

Demolition and Removal Work

- Recover and properly dispose of refrigerant as per the applicable codes.
- Remove each existing equipment electrical disconnect, and safely disconnect electrical supply to the unit.
- Disconnect equipment from existing chilled water and condenser water piping.
- Disconnect and secure BAS connections as necessary to perform work.
- Remove and dispose of existing HVAC equipment as listed in the table above.
- Properly dispose of all removed equipment and waste materials.

New Installation Work

Liquid Coolers

Item No.	Building	Area Served	Description	Manufacturer Model	Flow Rate GPM	Power	Qty.	Cooling Size MBH
1	City Hall	Condenser Loops for BP2 and Chiller	Liquid Cooler	Johnson Controls	115	208V 3ø	1	720
2	City Hall	Condenser Loop for BP1	Liquid Cooler	Johnson Controls VDCF113B10XXB	26	208V 3ø	1	142

Chiller

Item No.	Building	Area Served	Description	Manufacturer Model	Nominal Tons	Power	Qty.	CHW Flow (GPM)
1	City Hall	AHU-1, 2 &3	Chiller (C1)	Johnson Controls RW Series (R-410A)	30	208V 3ø	1	68

Pumps

Item No.	Building	Area Served	Description	Manufacturer Model	Flow Rate GPM	Power	Qty.
1	City Hall	Condenser Loops for BP2 and Chiller	Circulating Pumps	Taco	115	208V 3ø	2
2	City Hall	Condenser Loop for BP1	Circulating Pumps	Taco	26	208V 3ø	2

Electrical

- Furnish and install new electrical circuits to the new liquid coolers and circulating pumps.
- Furnish and install new electrical disconnect and/or circuit breaker (as applicable). The new electrical disconnect/s shall be installed adjacent to new pumps per state and local code requirements.
- Connect equipment to new electrical power wiring.

Mechanical

- Expand or replace existing concrete housekeeping pad for liquid cooler#1.
- Provide new concrete housekeeping pad for the new liquid cooler#2.
- Furnish and install one new 30-ton nominal capacity chiller as listed in the table above and connect to existing piping.
- Furnish and install two new liquid coolers as listed in the table above and connect to existing piping.
- Furnish and install new circulating pumps as listed in the table above and connect to new piping.
- Furnish and install new piping, valves and fittings as necessary. All new piping will be insulated in accordance with code.
- The installation shall include sealing of any new wall penetrations and flashing.
- Start up, commissioning, testing and balancing of the ground loop system including new liquid coolers.

Controls

Liquid coolers and circulating pumps – Furnish and install DDC controls, including communication bus and control power, to control the liquid coolers and circulating pumps. The new liquid cooler fans will be controlled, based on its standalone, packaged controls.

Furnish and install the items in the following point list for each new air-cooled liquid cooler:

- Liquid cooler start/stop/status
- Liquid cooler enable
- Condenser water supply temperature
- Condenser water return temperature
- Condenser water flow switch
- Circulating pump start/stop/status
- Circulating pump enable

ECM 5b - Control Improvements - City Hall

- Add motorized outdoor air dampers on each of the eleven water source heat pumps (AC-1 thru AC-11).
- Revise control sequence for the chiller to provide a more consistent chilled water temperature.
- Revise control sequence for the air handling units (AHU-1, 2 &3) serving the Council Chamber.

List of existing ground source heat pumps:

FACILITY	HP TAG	HP LOCATION	FLOOR SERVED	AREA SERVED	GROUND LOOP#	GROUND LOOP ID
CITY HALL	AC-1	GROUND FLR	GROUND FLR	WEST	BP1	WEST
CITY HALL	AC-2	GROUND FLR	GROUND FLR	MAINTENANCE OFFICE	BP3	EAST
CITY HALL	AC-3	GROUND FLR	GROUND FLR	MECHANICAL ROOM	BP1	WEST
CITY HALL	AC-4	1ST FLR	1ST FLR	CLERK OF COUNCIL WEST	BP1	WEST
CITY HALL	AC-5	1ST FLR	1ST FLR	CLERK OF COUNCIL EAST	BP3	EAST
CITY HALL	AC-6	1ST FLR	1ST FLR	SENIOR ADVISOR NORTH EAST	BP3	EAST
CITY HALL	AC-7	1ST FLR	1ST FLR	SENIOR ADVISOR NORTH WEST	BP1	WEST
CITY HALL	AC-8	ATTIC	2&3 FLRS	MAYOR'S SECRETARY'S OFFICE	BP2	ATTIC
CITY HALL	AC-9	ATTIC	2&3 FLRS	MAYOR'S OFFICE	BP2	ATTIC
CITY HALL	AC-10	ATTIC	2&3 FLRS	BREAK ROOM	BP2	ATTIC
CITY HALL	AC-11	ATTIC	ATTIC IT ROOM	IT ROOM	BP2	ATTIC

Demolition and Removal Work

- Remove & dispose existing CO2 sensors located in the return duct, one each for AHU1 and AHU2.

New Installation Work

Water Source Heat Pumps (AC-1 thru AC-11)

- Furnish and install new electric actuators (2-position) on existing volume dampers in the fresh air duct on eleven (11) water source heat pump units AC-1 thru AC-11.
- Provide electrical wiring to support new damper actuators.
- Furnish and install (11) eleven new network thermostats with integral occupancy sensors for AC-1 thru AC-11.
- Integrate damper actuators and new thermostats into a revised control schedule.

Council Chamber Air Handling Units (AHU-1, 2 &3)

- Furnish and install (2) new occupancy sensors in the Council Chamber.
- Furnish and install new low/high voltage wiring as required to integrate new occupancy sensors into AHU-3 control strategy.
- Furnish and install two CO_2 sensors located in the return duct, one each for AHU1 and AHU2.
- Integrate new occupancy sensors installed in the Council Chamber with the AHU-1, 2 &3 control strategy.

Revise control sequences as follows:

Water Source Heat Pumps (AC-1 thru AC-11)

Occupied hours: Monday through Friday, 6 AM to 6 PM, unoccupied otherwise.

During occupied hours, set outside air damper to open position, fan to remain on and maintain temperature set point as follows:

Heating: 70°F, Cooling 72°F

During unoccupied hours, close outdoor air damper and cycle fan as needed to maintain unoccupied temperature set points.

Heating: 68 °F, Cooling 76 °F

Council Chamber Air Handling Units (AHU-1, 2 &3)

The Council Chamber shall be designated to be in unoccupied mode after no occupancy is sensed by both occupancy sensors continuously for 30 minutes (adj.). While the unoccupied mode AHU-1, 2 &3 serving the Council Chamber will be operated as follows:

Cooling Setpoint (°F)	74
Heating Setpoint (°F)	68
Relative Humidity (%)	55

AHU-3 & exhaust/relief fan (EF-6) will remain off. Outside air dampers (OAD-1&2) and exhaust air dampers (EAD-1&2) will remain closed.

AHU-1&2 supply fans will be cycled at 50% speed (adj.) to maintain space temperature and relative humidity at unoccupied period setpoints as listed in the above table. Return air dampers (RAD-1&2) will remain fully open (100%).

AHU-1, 2 &3 serving the Council Chamber will be operated in **occupied mode** in the event of either of the following conditions:

1. Occupancy sensed by the occupancy sensors in the Council Chamber (2 minute delay (Adj.)
2. When the zone CO_2 rises above 1000ppm as sensed by either CO_2 sensors

Cooling Setpoint (°F)	72
Heating Setpoint (°F)	70
Relative Humidity (%)	55

AHU-1&2 supply fans will run continuously at 100% speed (adj.) to maintain space temperature and relative humidity at occupied period setpoints as listed in the above table. RAD-1&2 will modulate inversely in coordination with the OAD-1&2.

AHU-3 & EF-6 will be enabled and run continuously. The AHU-3 supply fan speed will modulate proportionately in response to the zone CO_2 level as per the reset schedule below:

AHU-3 Fan Speed (%)	20	100
Zone CO_2 Level (ppm)	1000	1200

EF-6 fan speed will modulate to maintain static pressure in the Council Chamber at the setpoint 0.02 in. w.c. (adj).

OAD-1&2 and EAD-1&2 positions will modulate simultaneously in coordination with the AHU-3 fan speed (as described above).

Council Chamber Chiller

The existing control sequence for Chiller C1 to remain with the exception of following changes to the setpoints based on occupied/unoccupied mode of operation for AHU-1, 2& 3:

When AHU-1, 2 &3 serving the Council Chamber are operating in **occupied mode**:

Enable stage-1 on the rise in return chilled water temperature above 47°F (Compressor 1-SP) and stage-2 on the rise in return chilled water temperature above 50°F (Compressor 2-SP). Disable stage-2 on the fall in return chilled water temperature below 47°F and stage-1 on the fall in return chilled water temperature below 44°F. Alternate lead and lag compressors based on the daily runtimes.

When AHU-1, 2 &3 serving the Council Chamber are operating in unoccupied mode:

Enable stage-1 on the rise in return chilled water temperature above 53°F (Compressor 1-SP) and stage-2 on the rise in return chilled water temperature above 57°F (Compressor 2-SP). Disable stage-2 on the fall in return chilled water temperature below 54°F and stage-1 on the fall in return chilled water temperature below 50°F. Alternate lead and lag compressors based on the runtimes.

ECM 6a -VRF HVAC System Upgrades - Joe Riley Ballpark

This ECM will replace existing aging direct expansion (DX) equipment utilizing R22 refrigerant at Joe Riley Ballpark facility with five (5) new high efficiency three pipe variable refrigerant flow systems (VRF) with heat recovery utilizing environmentally friendly R410A refrigerant. The existing dedicated outdoor air system shall remain as is.

Demolition and Removal Work

Electrical

- Remove existing electrical disconnect.
- Remove existing thermostat and/or building automation system (BAS) connections.
- Properly disconnect and isolate smoke alarms and other life safety devices connected to the unit.

Safely disconnect existing fan coil and condenser units as listed in the table below.

Building	Equipment Tag	Location	Area/Equip Served	Make	Model#	Serial#	Age	Tons	Existing Equipment IEER	Proposed Equipment IEER
JOSEPH P RILEY BALLPARK	CU-1 (HPU 14)	BELOW THE STADIUM	RIVERDOGS COACHES OFFICE	YORK	E1RD048S46B	W0L7321920	10	4	11.1	19.0
JOSEPH P RILEY BALLPARK	CU-2 (HPU 13)	BELOW THE STADIUM	MAINTENANCE OFFICE	YORK	THGD18S21S1A	W0E8825323	9	1.5	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-3 (HPU 19)	BELOW THE STADIUM	VENDING	YORK	THGD36S21S1A	W0F8941329	9	3	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-4 (HPU 18)	BELOW THE STADIUM	VISITOR LOCKER ROOM	INTERNATIONAL COMFORT PRODUCTS	CHE090GLCA	X082778609	9	7.5	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-5 (HPU-17)	BELOW THE STADIUM	UMPIERS LOCKER ROOM	YORK	THGD18S21S1A	W0E8825322	9	1.5	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-6 (OHP 4)	BELOW THE STADIUM	REAR OFFICES	YORK	E1RD048S46B	W0D8798670	9	4	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-7 (OHP 1)	BELOW THE STADIUM	GIFT SHOP	YORK	E1RD060S46B	W0L7389425	10	5	11.1	19.0
JOSEPH P RILEY BALLPARK	CU-8 (OHP 2)	BELOW THE STADIUM	FRONT OFFICE	YORK	E1RD048S46B	W0C7517268	10	4	11.1	19.0
JOSEPH P RILEY BALLPARK	CU-9 (OHP 5)	BELOW THE STADIUM	TICKET OFFICE	YORK	THGD24S21S1A	W0F8928384	9	2	10.3	19.0

Building	Equipment Tag	Location	Area/Equip Served	Make	Model#	Serial#	Age	Tons	Existing Equipment IEER	Proposed Equipment IEER
JOSEPH P RILEY BALLPARK	CU-10 (OHP 3)	BELOW THE STADIUM	DAVE OFFICE	YORK	YHJC48S4483A	W1N0535385	7	4	10.7	19.0
JOSEPH P RILEY BALLPARK	CU-11	BELOW THE STADIUM	BEER GARDEN	YORK	BRCS0181BD	980580442	12	1.5	7.5	19.0
JOSEPH P RILEY BALLPARK	CU-12	ROOF (CLOSE TO ACCESS)		MCQUAY	ACZ033ACS27-ER11	STNU070900275	10	33	9.2	19.0
JOSEPH P RILEY BALLPARK	CU-13 (CU-1)	ROOF	401	YORK	E1RD048S46B	W0E8850266	9	4	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-14	ROOF	402	YORK	E1RD048S46B	W0E8850267	9	4	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-15	ROOF		JOHNSON CONTROLS	J10YCC00A4AAA2A	N1C2642510	5	10	12.9	19.0
JOSEPH P RILEY BALLPARK	CU-16	ROOF	404	YORK	E1RD036S46B	W0E8881173	9	3	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-17	ROOF	403	YORK	E1RD048S46B	W0E8850265	9	4	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-18	ROOF	405	YORK	E1RD036S46B	W0C8688202	9	3	10.3	19.0
JOSEPH P RILEY BALLPARK	RTU-1	ROOF		JOHNSON CONTROLS	XN060E07B4A1ACA1A1A	N1A7357144	0	5	12.9	19.0
JOSEPH P RILEY BALLPARK	CU-20	ROOF	406	YORK	E1RD036S46B	W0C8688195	9	3	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-21	ROOF	407	YORK	E1RD048S46B	W0E8850263	9	4	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-22	ROOF	407	YORK	EIR	PICTURE NOT CLEAR	9	4	10.3	19.0
JOSEPH P RILEY BALLPARK	CU-23	ROOF	408	YORK	EIRD048S46B	W0E8850269	9	4	10.3	19.0
JOSEPH P RILEY BALLPARK	RTU-2	ROOF		JOHNSON CONTROLS	XP078E09D4A1BCA1A1	N1A7336700	0	6.5	12.3	19.0
JOSEPH P RILEY BALLPARK	RTU-3	ROOF	NEW RENOV	JOHNSON CONTROLS	ZR240N30P4A1ACA1A1		0	20	12.1	19.0
JOSEPH P RILEY BALLPARK	CU-24	GROUND		MCQUAY	ACZ033ACS27-ER11	STNU061200127	11	33	7.5	19.0
JOSEPH P RILEY BALLPARK	CU9	ROOF	THIRD FLOOR LARGE MEDIA ROOM	YORK	E1RD036S46B	W0M7449090	10	3	11.1	19.0
JOSEPH P RILEY BALLPARK	CU10		SMALL MEDIA ROOMS	YORK	H3CE120A46A	N0E6254509	11	10	7.7	19.0
JOSEPH P RILEY BALLPARK	RTU		BATTER'S CAGE	YORK	ZF072E10R40ZZ10001A	N1C1856904	6	6	10.7	19.0
JOSEPH P RILEY BALLPARK	HPU 16		CITADEL LOCKER ROOM	YORK	E1RA090S46H	W0E7729788	10	7.5	9.5	19.0
JOSEPH P RILEY BALLPARK	HPU 15		RIVERDOGS LOCKER ROOM	YORK	E1RA090S46H	W0E7729790	10	7.5	9.5	19.0

Mechanical

- Remove and reinstall suspended ceiling panels as needed.
- Recover and dispose of refrigerant according to state and local codes.
- Safely disconnect equipment from existing ducting, line sets, condensate drain piping, as well as natural gas, propane or steam/hot water piping.
- Temporarily seal or cap all disconnected utilities.

- Remove existing fan coil, condenser units and curbs for roof-mounted units and dispose of properly. Customer has right of first refusal.

New Installation Work

- Furnish and install new York variable refrigerant flow systems and equipment as listed in Appendix 6a Joe Riley VRF report in the locations noted.
- Provide new curb adapters and supports if required, for the HVAC units located on the roof.
- Provide new curb flashing and sealing of roof penetrations related to this work, if required.
- Provide new concrete pads for the HVAC units mounted on the ground.
- Equipment supports to be compliant with local seismic and hurricane regulations.
- Provide electrical connections, with new electrical disconnect.
- Modify electrical power wiring distribution panel as needed. Existing electrical wiring will be reused as much as possible.
- Reconnect new equipment to existing ductwork reusing existing roof penetrations. If required, provide transition ductwork. Insulate any new ductwork.
- Reconnect new equipment to existing condensate drain piping
- Startup, checkout and verify full range of operation and control features per manufacturers' startup and checkout procedures.
- Clean up of all job related debris daily. Clean up and store tools, equipment, etc. daily and remove after successful installation and operational checkout.
- Reconnect new equipment to BAS through integration.

ECM 7a - HVAC Controls Improvements - Greenberg Municipal Complex

- Implement duct static pressure reset on the variable air volume units RTU-1 &2.
- Control amount of ventilation air brought into the space by RTU-3 &4 during the occupied-standby modes for the 1st and 2nd floor court rooms.
- Recommission existing (39) parallel flow fan powered VAV boxes serving DMV and Municipal Court buildings, to include demand control ventilation (DCV) strategy.

Existing Rooftop Units:

UNIT TAG	RTU-1	RTU-2	RTU-3	RTU-4
FACILITY	TRAFFIC & TRANSPORTATION	MUNICIAL COURT	MUNICIAL COURT (1st FLR COURTROOM)	MUNICIAL COURT (2nd FLR COURTROOM)
UNIT TYPE	VAV	VAV	CONSTANT VOLUME	CONSTANT VOLUME
HEAT RECOVERY	N/A	N/A	HEAT WHEEL	HEAT WHEEL

Demolition and Removal Work

- N/A

New Installation Work

- Furnish and install (2) new occupancy sensors one each in the 1st and 2nd floor court rooms.
- Furnish low/high voltage wiring for the new occupancy sensors.
- Integrate new occupancy sensors installed in the 1st and 2nd floor court rooms with the respective rooftop units RTU-3&4 control strategies.
- Furnish and install new CO_2 sensors for the (39) existing parallel flow fan powered VAV boxes.

Revise control sequences as follows:

RTU-1&2 Duct Static Pressure Reset

- Implement duct static pressure reset control strategy for the variable volume RTUs-1&2.
- The duct static pressure setpoints will be reset based on the VAV box damper positions.

RTU-3 & 4 Ventilation Control

The RTU shall be designated to be in occupied-standby mode after no occupancy is sensed by the occupancy sensor continuously for 30 minutes (adj.) in the court room. During the occupied-standby mode, the heat recovery unit on the RTU shall be disabled. The RTU shall maintain space temperature at occupied period temperature setpoint during the occupied-standby period.

During the unoccupied period, RTU supply fan shall cycle to maintain space temperature at unoccupied period temperature setpoint. The heat recovery unit on the RTU shall remain OFF during the unoccupied period.

VAV Box Re-commissioning

- Perform thorough condition assessment for the existing (39) parallel flow fan powered boxes.
- Repair or replace components (controller/linkage/sensors/transmitters/others) critical for the functioning of the VAV box.
- Re-evaluate current operating parameters (cooling max cfm, cooling min cfm, heating cfm etc.) for the existing parallel flow fan powered VAV boxes.
- Specify cooling minimum flow setpoint for each VAV box based on the building component for the spaces served by the respective VAV box as per the current ASHRAE standard.
- Provide and install (39) new wall mounted CO_2 sensors in the breathing zone for each VAV box.
- Integrate new CO_2 sensors in the VAV box control strategy.
- Program and commission demand control ventilation (DCV) strategy to reset cooling minimum flow setpoints for the VAV boxes based on the CO_2 level. During the occupied mode, when the zone CO_2 level is below 1000ppm, VAV box cooling minimum flow will be set to the new cooling minimum flow setpoint specified by the Design Engineer. As the CO_2 level rises above 1000ppm, cooling minimum flow setpoint will increase proportionally, and vice versa.
- The outside air dampers on the RTUs serving the VAV boxes will modulate to deliver increased ventilation (above the fixed minimum) based on the occupancy.

ECM 7b - HVAC Equipment Replacement - Greenberg Municipal Complex

Replace existing packaged roof-top air-cooled air-conditioning equipment with new higher-efficiency equipment, as listed in the table below:

Existing Rooftop Units:

UNIT TAG	RTU-1	RTU-2	RTU-3	RTU-4
FACILITY	TRAFFIC & TRANSPORTATION	MUNICIAL COURT	MUNICIAL COURT	MUNICIAL COURT
YORK MODEL#	YPAL055CVB46BBBX	YPAL050CVB46BBB	DH102C00N4BAC3A	DH090C00N4BAC3A
YORK SERIAL#	RKMM005681	RKMM006582	NHMM094774	NHMM094787
NOMINAL TONS	50	48	7.3	8.6
UNIT TYPE	VAV	VAV	CONSTANT VOLUME	CONSTANT VOLUME
REFRIGERANT	R-407C	R-407C	R-22	R-22
HEAT RECOVERY	N/A	N/A	HEAT WHEEL	HEAT WHEEL

Demolition and Removal Work

- Recover and properly dispose of refrigerant as per the applicable codes.
- Remove each existing equipment electrical disconnect, and safely disconnect electrical supply.
- Disconnect equipment from existing ducting and condensate drain piping.
- Disconnect and secure existing BMS connections as necessary to perform work.
- Remove and dispose of existing HVAC equipment as listed in the table above.
- Properly dispose of all removed equipment and waste materials.

New Installation Work

Proposed Rooftop Units:

UNIT TAG		RTU-1	RTU-2	RTU-3	RTU-4
FACILITY		TRAFFIC & TRANSPORTATION	MUNICIAL COURT	MUNICIAL COURT	MUNICIAL COURT
SUPPLY CFM		17,500	14,000	2,720	2,400
O.A. CFM		1,600	2,500	1,500	1,500
APPROX. MOTOR HP		30	25	2	2
EXT. S.P. INCH W.C.		3	3	1	1.5
TOTAL S.P. INCH W.C.		4	4	1.5	2
ENT. AIR	DB °F	77.9	79.7	80	80
	WB °F	62.9	64.8	67	67
LVG. AIR	DB °F	51.94	52.91	56	57
	WB °F	50.14	50.63	56	56
TOTAL COOLING CAP. (BTUH)		599,000	576,000	103,000	88,000
SENS. COOLING CAP. (BTUH)		474,000	400,000	70,000	60,000
UNIT ELECTRICAL V/PH/HZ		480/3/60	480/3/60	480/3/60	480/3/60
YORK MODEL#		YPAL051CVE46BBFXN	YPAL050CVE46BBFXN	J08ZJC00B4A6BAB1A1	J07ZJC00B4A6BAB1A1
REFRIGERANT		R-410A	R-410A	R-410A	R-410A

PROVIDE WITH ACOUSTIC AND SEISMIC ROOF CURB ADAPTERS.
PROVIDE 5" MIN. DEEP SEAL TRAP AND PIPE TO ROOF DRAIN. DRAIN PIPING SHALL BE PVC
RTU-1 AND RTU-2 WITH VFD CONTROL.
PROVIDE RTU-3 AND RTU-4 WITH TOTAL ENTHALPY WHEELS.
TOTAL AND SENSIBLE LOADS INDICATED INCLUDE FAN HEAT.
HEAT WHEEL FOR RTU-3: 1500 CFM; MINIMUM WHEEL EFFECTIVENESS OF 73%.
HEAT WHEEL FOR RTU-4: 1200 CFM; MINIMUM WHEEL EFFECTIVENESS OF 73%.
PROVIDE RTU-3 AND RTU-4 WITH 18 KW SUPPLEMENTAL HEATERS.
PROVIDE WITH UNIT MOUNTED DISCONNECT SWITCH.

- Furnish and install new HVAC equipment as listed in the table above at existing locations.
- Provide new curb adapters and supports as required, for the HVAC units located on the roof.
- Provide new curb flashing and sealing of roof penetrations related to this work, as required.
- Equipment supports to be compliant with local seismic and hurricane regulations.
- Provide electrical connections, with new electrical disconnect.
- Modify electrical power wiring distribution panel as needed. Existing electrical wiring will be reused as much as possible.
- Reconnect new equipment to existing ductwork reusing existing roof penetrations. If required, provide transition ductwork. Insulate any new ductwork.
- Reconnect new equipment to existing condensate drain piping.
- Startup, checkout and verify full range of operation and control features per manufacturers' startup and checkout procedures.
- Clean up of all job related debris daily. Clean up and store tools, equipment, etc. daily and remove after successful installation and operational checkout.
- Reconnect new equipment to existing BAS.
- Program new RTU sequences for operation utilizing static pressure reset and demand control (DCV) strategy as described in the Schedule 2; Section III.

ECM 8a - Dual Duct Box Replacement - POLICE STATION

Replace existing dual duct boxes serving the Police Headquarter building to convert existing constant volume dual duct system to new energy efficient pressure independent variable volume dual duct system.

Existing Dual Duct Box Schedule:

Box No.	Max Cooling CFM	Inlet Diameter (inches)
1	300	8
2	720	10
3	740	12
4	360	8
5	650	8
6	400	8
7	648	8
8	720	8
9	2060	14
10	1010	10
11	1208	12
12	1475	13
13	810	7
14	2681	16
15	970	10
16	365	6
17	710	12
18	291	6
19	193	5
20	700	9
21	731	10
22	Not used	Not used
23	312	6
24	206	6
25	2925	16
26	600	8
27	951	8
28	1546	14
29	1670	14
30	665	10
31	826	10
32	1110	10

Box No.	Max Cooling CFM	Inlet Diameter (inches)
33	300	6
34	1055	12
35	570	8
36	906	9
37	380	6
38	1400	12
39	520	7

Demolition and Removal Work

- Carefully remove existing ceiling tile and ceiling grid to permit removal of dual duct boxes. Salvage ceiling tile and grid for replacement.
- Disconnect, remove and properly dispose of existing dual duct boxes.
- Disconnect, remove and properly dispose of existing variable frequency drives (supply & return fans) on AHU-1 serving the dual duct boxes.
- Disconnect and secure existing BMS connections as necessary to perform work.
- Properly dispose of all removed equipment and waste materials.

New Installation Work

- The specifications for the proposed dual duct VAV boxes are as follows:
    - Match dual duct VAV box sizes to existing
    - 22 gauge construction
    - 3/4" fiberglass insulation
    - Controls enclosure
    - 24 VAC 50VA controls transformer
    - DDC controls factory mounted and pre-wired
- Furnish & install new dual duct VAV boxes as per manufacture's criteria and applicable local codes.
- Provide temporary storage for the new dual duct VAV boxes during construction.
- The new dual duct VAV boxes shall be located in the existing locations with ductwork extended as required for proper connections.
- Connect power to the new dual duct boxes. Reuse existing electrical devices and wiring where possible.
- Replace ductwork where damaged during installation.
- Reinstall salvaged ceiling tiles and ceiling grid.

- Reuse existing ductwork and hangers/supports where feasible.
- Furnish and install two new variable frequency drives for the AHU-1 supply and return fans.
- Connect power to the two new variable frequency drives. Reuse existing electrical devices and wiring where possible.
- Provide static pressure control programming and commissioning for the two (supply & return fan) new variable frequency drives.
- Connect and commission factory-mounted and wired controls on the dual duct boxes.
- Provide interface with existing building automation system as necessary.
- Set up 15 mins interval trends for the following points. Data to be available for a minimum of 13 months.
    - Heating cfm along with damper position
    - Cooling cfm along with damper position
    - Discharge air temperature
    - Zone temperature
- Startup, checkout and verify all modes (stages) of operation (by factory authorized representative) to include ALL unit control features per manufacturers' startup and checkout procedures. Clean up of all job related debris daily. Clean up and store tools, equipment, etc. daily and remove after successful installation and operational checkout.
- Provide post installation test and balance on VAV's and input from previous settings.

ECM 8b - Chiller Replacement - POLICE STATION

Replace one existing lower-efficiency air-cooled chiller with a new high-efficiency air-cooled chiller as listed in the table below. The new chiller will utilize environmentally friendly R-410a refrigerant.

Chiller Replacement

Facility Name		Qty.	Make	Model #	Size	Air/Water Cooled	Efficiency (kW/Ton)
Police Station (180 Lockwood Dr.)	Existing>	1	TRANE	RTAA1704XR01A3DOBG	170	Air-cooled	1.13
	Proposed>	1	YORK	YLAA0170SE46XFBBXTX	170	Air-cooled	0.7

Demolition and Removal Work

- Reclaim and properly dispose of refrigerant and oil per local codes.
- Disconnect, remove and properly dispose of chilled water piping to nearest isolation valves or as required for new installation.
- Disconnect, remove and properly dispose of existing chilled water pump.
- Disconnect, remove and properly dispose of all other materials or debris related to this installation.
- Disconnect and secure building automation system connection.
- Disconnect and secure electrical connections to the chiller.
- Disconnect, remove and properly dispose of existing 170-ton nominal capacity chiller located on the roof.

New Installation Work

1. Furnish and install one new high efficiency air-cooled chiller as listed in the table above per manufacturer's criteria and local codes:

   Chiller specifications:

   a. 170-ton nominal capacity chiller (air-cooled)

   b. Refrigerant R410A

   c. The new chiller will have:

      i. Chiller management system

      ii. BACnet capability for operation verification only by building automation system

      iii. Factory installed sound reduction

      iv. Ultra Quiet - Low speed, reduced noise fans

      v. Compressor Acoustic Sound Blankets.

   d. Chiller and controls to comply with applicable regulations.

e. Furnish and install seismic restraints and vibration isolation as required.

f. Ensure new chiller has piping package to include "Y" strainer.

2. The new chiller shall be located in the existing location with chilled water and other piping extended as required for connection.

3. Furnish and install new isolation valves for supply and return at chiller on roof.

4. Provide and install one new chilled water pump per below or approved equal.

Customer Asset ID #	Facility Name	Chiller Location	Qty.	GPM	HP	TDH Ft. H2O	RPM	Type	Mfg
CHWP-1	Police Station	Mechanical Room	1	407	20	100	1750	Base Mount End Suction	B&G e-1510 3EB

5. Provide temporary cooling during the construction. Furnish and install new "T" in piping at pump so a temporary chiller can be attached during the chiller replacement work.

6. Reconnect chilled water piping to the new chiller. Match the existing pipe size.

7. Furnish and install new isolation valves at chilled water pump.

8. Furnish and install new triple duty valve at chilled water pump.

9. Furnish and install new suction diffuser at new chilled water pump.

10. Furnish and install new inertia base for new chilled water pump. Provide and install flex coupling in the piping.

11. Insulate new piping, valves and fittings as required to match existing. Re-insulate any piping where insulation was damaged during the installation.

12. Reuse existing piping, pipe fittings, pipe hangers/supports, thermal wells, and pressure-sensor wells where feasible and serviceable.

13. Flush all new water pipe and chilled water lines, and bleed air from the system.

14. Startup, checkout and verify all modes (stages) of operation (by factory authorized representative) to include measurement and verification of "part-load" and "full-load" efficiencies, and ALL unit control features per manufacturers' startup and checkout procedures.

15. Provide water side test and balance for leaving chiller water.

Controls

1. Connect factory-mounted and wired controls.

2. Disconnect and reconnect to existing controls and control valves.

3. Provide interface with existing building automation system.

4. Set up hourly trends of totalized kWh and totalized Btus delivered. Btus will be calculated based on the flow measured during the T&B and supply and return chilled water temperatures. Data to be available for a minimum of 13 months.

Electrical

1. Connect power to the new chiller. Reuse existing electrical devices and wiring where possible. Replace devices and wiring only if found to be of insufficient size, insufficient length or in poor condition.

2. Connect power to the new chilled water pump. Reuse existing electrical devices and wiring.

3. Install kW meter for the new chiller as required for Measurement and Verification.

ECM 8c - AHU2 System Improvement - POLICE STATION

Replace an existing 46 year old pneumatically controlled single zone AHU-2 that is beyond its useful life currently serving the evidence holding area with a new single zone variable air volume AHU equipped with DDC capable of implementing demand control ventilation (DCV) strategy.

Demolition and Removal Work

- Disconnect and secure electrical connections to AHU-2.
- Disconnect, remove and properly dispose of chilled water piping to the nearest isolation valves or as required for new installation.
- Disconnect, remove and properly dispose of chilled water and hot water control valves
- Disconnect existing pneumatic system serving existingAHU-2 and plug tube ends.
- Disconnect and secure existing BAS connections as necessary to perform work.
- Disconnect, remove and properly dispose of AHU-2 located in the 2nd floor mechanical room at the Central Police Station facility.
- Disconnect, remove and properly dispose of all other materials or debris related to this project.

New Installation Work

- The specifications for the proposed AHU-2 are as follows:
    - Match heating and cooling capacities to existing AHU
    - standard gauge interior and exterior construction
    - 2" foam insulation
    - Factory mounted and wired variable frequency drive (VFD)
    - DDC controls factory mounted and pre-wired
- Furnish and install new AHU-2 as per manufacture's criteria and applicable local codes.
- The new AHU-2 shall be located in the existing location with ductwork modified as required for proper connections.
- Verify existing AHU mounting pad is of adequate size for the new AHU. If necessary, extend existing mounting pad as per the applicable local codes.
- Furnish and install seismic restraints and vibration isolation as required.
- Reconnect chilled water & hot water piping to the new AHU. Match the existing pipe size.
- Furnish and install new heating hot water and chilled water control valves.
- Connect power to the new AHU-2. Reuse existing electrical devices and wiring. If devices and wiring are found to be of insufficient size, insufficient length or in poor condition, then replace.
- Insulate all new piping, valves and fittings as required to match existing. Insulate any piping where insulation was damaged during installation.
- Reuse existing piping, pipe fittings, pipe hangers/supports, isolation valves, strainers, check valves, thermal wells, and pressure-sensor wells where feasible and serviceable.
- Reuse existing ductwork and hangers/supports where feasible.
- Furnish and install ductwork where damaged during installation.
- Furnish and install sensors, transmitters, devices etc. shipped loose with the unit.
- Connect and commission factory-mounted and wired controls.
- Furnish and install new return air temperature sensor and new return air CO2 sensor.
- Provide interface with existing building automation system as necessary.
- Startup, checkout and verify all modes (stages) of operation (by factory authorized representative) to include ALL unit control features per manufacturers' startup and checkout procedures.
- Provide air side test and balance for leaving air to spaces.

- Set up 15 mins interval trends for the following points. Data to be available for a minimum of 13 months.
    - AHU schedule (occupied/unoccupied)
    - Supply fan command and status
    - Supply fan speed
    - Return air temperature
    - Mixed air temperature
    - Discharge air temperature
    - Space temperature
    - Zone CO_2 in ppm

ECM 9 - Chiller Replacement - DOCK STREET THEATER

This ECM will replace one existing old lower-efficiency air-cooled chiller with new high-efficiency air-cooled chiller as listed in the table below. The new chiller will utilize environmentally friendly R-410a refrigerant.

Chiller Replacement

Facility Name		Qty.	Make	Model #	Size	Air/Water Cooled	Efficiency (IPLV)
DOCK STREET THEATRE	Existing>	1	YORK	YCAL0124EC17XBADBTXXX	124	Air-cooled	9.96
	Proposed>	1	YORK	YLAA0136SE17XFBSDTX	124	Air-cooled	15.74

Demolition and Removal Work

- Reclaim and properly dispose of refrigerant and oil per local codes.
- Disconnect, remove and properly dispose of chilled water piping to nearest isolation valves or as required for new installation.
- Disconnect, remove and properly dispose of existing chilled water pump package.
- Disconnect and secure building automation system connection.
- Disconnect and secure electrical connections to the chiller.
- Disconnect, remove and properly dispose of existing 124-ton nominal capacity chiller located on the roof.
- Disconnect, remove and properly dispose of all other materials or debris related to this installation.

New Installation Work

1. Furnish and install one new high efficiency air-cooled chiller as listed in the table above per manufacturer's criteria and local codes:

Chiller specifications:

a. 124-ton nominal capacity chiller (air-cooled)

b. Refrigerant R410A

c. The new chiller will have:

i. Chiller management system

ii. BACnet capability for operation verification only by building automation system

d. Chiller and controls to comply with applicable regulations.

e. Furnish and install seismic restraints and vibration isolation as required.

f. Ensure new chiller has piping package to include "Y" strainer.

2. The new chiller shall be located in the existing location with chilled water and all other piping extended as required for connection.

3. Furnish and install new isolation valves for supply and return at chiller on roof.

4. Furnish and install new skid mounted chilled water pumping package consisting of two 10 HP variable speed secondary chilled water pumps and one 10 HP constant speed primary chilled water pump. The skid mounted pumping package shall include a NEMA 4 enclosure with two variable frequency drives (VFDs) for the secondary chilled water pumps. The skid mounted chilled water pumping package shall be factory wired.

5. Furnish and install shot feeder as a part of the chilled water pump package.

6. Provide heat tape for the chilled water piping.

7. Provide temporary cooling during the construction if required. Furnish and install new "T" in piping at pump so a temporary chiller can be attached during the chiller replacement work.

8. Reconnect chilled water piping to the new chiller. Match the existing pipe size.

9. Furnish and install new isolation valves at chilled water pump.

10. Furnish and install new isolation valves at chilled water pump.

11. Furnish and install new suction diffuser at new chilled water pump.

12. Furnish and install new inertia base for new chilled water pump. Provide and install flex coupling in the piping.

13. Insulate new piping, valves and fittings as required to match existing. Re-insulate any piping where insulation was damaged during the installation.

14. Reuse existing piping, pipe fittings, pipe hangers/supports, isolation valves, strainers, thermal wells, and pressure-sensor wells where feasible and serviceable.

15. Flush all new water pipe and chilled water lines, and bleed air from the system.

16. Provide water side test and balance for chiller and pump skid.

17. Startup, checkout and verify all modes (stages) of operation (by factory authorized representative) to include measurement and verification of "part-load" and "full-load" efficiencies, and ALL unit control features per manufacturers' startup and checkout procedures.

Controls

1. Connect factory-mounted and wired controls.

2. Disconnect and reconnect to existing controls and control valves.

3. Provide interface with existing building automation system.

4. Set up hourly trends of totalized kWh and totalized Btus delivered. Btus will be calculated based on the flow measured during the T&B and supply and return chilled water temperatures. Data to be available for a minimum of 13 months.

Electrical

1. Connect power to the new chiller. Reuse existing electrical devices and wiring where possible. Replace devices and wiring only if found to be of insufficient size, insufficient length or in poor condition.

2. Connect power to the new chilled water pump package. Reuse existing electrical devices and wiring where possible.

3. Install kW meter at chiller as required for Measurement and Verification.

ECM 10 - Chiller Replacement - VRTC - DEAN BUILDING

Replace one existing old lower-efficiency air-cooled chiller with new high-efficiency air-cooled chiller as listed in the table below. The new chiller will utilize environmentally friendly R-410a refrigerant. Replacement of the old chiller will reduce future chiller repair and replacement expenditures.

Chiller Replacement

Facility Name		Qty.	Make	Model #	Size	Air/Water Cooled	Efficiency (IPLV)
VRTC – DEAN BUILDING	Existing>	1	YORK	YCAL0104EC46XCASBT	104	Air-cooled	10.3
	Proposed>	1	YORK	YLAA0101HE46XFBBXTX	100	Air-cooled	15.63

Demolition and Removal Work

- Reclaim and properly dispose of refrigerant and oil per local codes.
- Disconnect, remove and properly dispose of chilled water piping to nearest isolation valves or as required for new installation.
- Disconnect and secure building automation system connection.
- Disconnect and secure electrical connections to the chiller.
- Disconnect, remove and properly dispose of existing 104-ton nominal capacity chiller located on the ground.
- Disconnect, remove and properly dispose of all other materials or debris related to this installation.

New Installation Work

1. Furnish and install one new high efficiency air-cooled chiller as listed in the table above per manufacturer's criteria and local codes:

   Chiller specifications:

   a. 100-ton nominal capacity chiller (air-cooled)

   b. Refrigerant R410A

   c. Each new chiller will have:

      iii. Chiller management system

      iv. BACnet capability for operation verification only by building automation system

d. Chiller and controls to comply with applicable regulations.

e. Furnish and install seismic restraints and vibration isolation as required.

f. Ensure new chiller has piping package to include "Y" strainer.

2. The new chiller shall be located in the existing location with chilled water and all other piping extended as required for connection.

3. Furnish and install new isolation valves for supply and return at the chiller.

4. Provide new pipe stands for pipes at the chiller.

5. Reconnect chilled water piping to the new chiller. Match the existing pipe size.

6. Furnish and install new shot feeder for the new chiller.

7. Insulate new piping, valves and fittings as required to match existing. Re-insulate any piping where insulation was damaged during the installation.

8. Reuse existing piping, pipe fittings, pipe hangers/supports, isolation valves, strainers, check valves, thermal wells, and pressure-sensor wells where feasible and serviceable.

9. Flush all new water pipe and chilled water lines, and bleed air from the system.

10. Startup, checkout and verify all modes (stages) of operation (by factory authorized representative) to include measurement and verification of "part-load" and "full-load" efficiencies, and ALL unit control features per manufacturers' startup and checkout procedures.

Controls

1. Connect factory-mounted and wired controls.

2. Disconnect and reconnect to existing controls and control valves.

3. Provide interface with existing building automation system as necessary.

4. Set up hourly trends of totalized kWh and totalized Btus delivered. Btus will be calculated based on the flow measured during the T&B and supply and return chilled water temperatures. Data to be available for a minimum of 13 months.

Electrical

1. Connect power to the new chiller. Reuse existing electrical devices and wiring where possible. Replace devices and wiring only if found to be of insufficient size, insufficient length or in poor condition.

2. Connect power to the new chilled water pump package. Reuse existing electrical devices and wiring.

3. Install kW meter as required for Measurement and Verification.

Inclusions, Exclusions and Assumptions Applicable to ECM 4 – ECM 10:

Inclusions:

- All required cranes and rigging, with city coordination of street or parking lot traffic control and closures.
- Installation to be performed to mechanical, electrical, fire, etc., local, state, national installation and operational codes in effect at the time of contract signing.
- Obtain required licenses permits and inspections.
- Submit Operations and Maintenance (O&M) documentation in Adobe Acrobat® format.
- Structural analysis.
- Startup and checkout.

Exclusions:

- Repair or replacement of defective mechanical, electrical or controls equipment, and the electrical distribution system, except the equipment described in the FIM description. Johnson Controls will identify the location of defective equipment and notify City of Charleston.
- Repair or upgrades required due to bring adjacent controls, electrical, building, and mechanical systems up to code.
- Structural modification to the existing roof structure unless covered under separate contract.
- Overtime work caused by unforeseen circumstances beyond the control of Johnson Controls, such as or scheduling changes by City of Charleston. The cost difference between the overtime work wages and normal time work wages will be the responsibility of City of Charleston calculated as [(overtime rate – normal rate) x hours].
- Asbestos abatement and removal for this project is entirely the responsibility of City of Charleston. Johnson Controls is continuing to work with City of Charleston and our subcontractors to sufficiently identify the scope, costs and project scheduling implications of any required abatement such that City of Charleston can adequately plan for this requirement. If hazardous materials are encountered during the implementation phase, Johnson Controls will immediately stop work, take measures to reduce any contamination, and notify the City of Charleston facility manager of the possible hazardous material condition and location. Johnson Controls will then request that City of Charleston remove and dispose of the hazardous materials prior to any continuation of work. Hazardous materials encountered during the ongoing service phase of the project will remain the property and disposal responsibility of City of Charleston.

- The cost of hazardous material abatement or removal, such as asbestos, mold and lead paint that is not currently specified in the engineering scope of work. In the event hazardous materials are uncovered and abatement is beyond the ability of Johnson Controls to abate under this contract, the FIM will be evaluated for possible removal from the scope of work or the transfer of this responsibility to City of Charleston.
- Air and water balancing will be limited only to the equipment being replaced.
- Existing building ventilation conditions and indoor air quality issues (if any, except where it is was discussed with City of Charleston during development of project and documented above) are excluded from the scope and cost of this project.
- Temporary space conditioning, unless otherwise specified.
- Engineering services, studies or analysis associated with any exclusions or work clearly outside of the scope definition.
- Roof repairs other than those directly associated with this scope of work.
- Duct cleaning and coil cleaning unless otherwise identified in a FIM Scope of Work.
- Duct work repair and/or replacement for air handling units will be limited to the confines of the mechanical room unless otherwise identified in a FIM Scope of Work.
- Resolution of existing design, service, and or distribution conditions known or unknown.
- Repair or replacement of fire and life safety systems
- Temporary space conditioning unless otherwise identified in the Scope of Work.
- Repairs/replacement of insulation, piping or ductwork found to be corroded or rusted and unacceptable for installation of components or fittings required for installation other than what is specified in the Scope of Work

ECM 11a - Pool Enclosure and Upgrade - MLK POOL

This ECM will furnish and install a new approximately 80' Wide by 188' Long pool enclosure over the existing Martin Luther King pool. The enclosure will have an addition of an approximately 61' x 41' enclosure over the wading area.

Installation of this ECM shall not commence until month 12 of the installation schedule and upon receipt of a written Notice to Proceed by the City. Installation may commence sooner at the direction of the City accompanied with a written Notice to Proceed.

The pricing for the pool enclosure is a guaranteed maximum price. If the engineering activities indicate that the cost is lower than currently included, the amount of the cost reduction will be added to the amount provided in ECM 11b.

Pool Enclosure

MLK Enclosure Specifications

- Building size is approximately 80' Wide by 188' long with an addition of approximately 61" Wide by 41' long enclosure over wading area
- Structural aluminum in owner selected color choices of white or bronze baked enamel.
- 31 Retractable roof bay panels with bays in both roof slopes
- The retractable roof panels will be motorized and retractable with a panel size of 8' by 9'.
- Panels shall be poly carbonate in owner selected color of bronze tint, clear or opal.
- Sidewall #1 shall have an eave height of 10 feet containing 23 sliding glass doors with insulated and tempered glass. A 36" transom glazed in 16mm clear polycarbonate will extend from the top of the sliding glass door to eave.
- Sidewall #2 shall be the same as sidewall #1.
- Gable #1 shall contain nine (9) 80" x 68" sliding glass doors and one (1) 30" x 70' commercial swing door with panic hardware with insulated and tempered glass. The remaining area in the upper and lower gable will be glazed in 16 mm clear polycarbonate.
- Gable #2 shall contain thirteen (13) 80" x 68" sliding glass doors and one (1) 30" x 70" commercial swing door with panic hardware with insulated and tempered glass. The remaining area in the upper and lower gable will be glazed in 16 mm clear polycarbonate.

Thermal

Enclosure shall provide thermal isolation between exterior and interior structural components by santoprene or equivalent gaskets to diminish the possibility of condensation forming on the interior metal surfaces. The thermal isolation gaskets will not eliminate the possibility that condensation will form.

Water & Moisture

Enclosure shall comply with design and performance requirements specified in the building codes in effect at the time of contract signing and as specified below. In designing and engineering the work, the following principles shall be followed:

- Enclosure shall have provisions to drain the exterior face of assembly of any water entering at joints and any condensation occurring within the framing with internal weep channels.
- At design conditions no water penetration to the interior side of the assembly shall occur.

- Assembly shall be watertight to the interior subject to the interior and exterior design conditions in combination with movements occurring due to loads imposed.

Product Warranty

Manufacturer's standard 1 year warranty from customer acceptance of this measure against defects in material and labor of the work in this section; that the work will be water and weather tight, structurally sound and free from distortion and deformation under load; glazing gaskets and sealant will be free from distortion from sunlight, weather and oxidation and will be free from permanent deformation under load.

Polycarbonate:

Provide Manufacturer's standard warranty against: 10 year limited from customer acceptance of this measure.

- Defective materials and defects in manufacturing
- Discoloration.
- Hail damage

Glass:

Provide Manufacturer's standard warranty against:

- Defects in insulating glass units.
- Material obstruction of vision as a result of dust for film formation on the internal glass surfaces by any cause, under normal conditions, other than extrinsic glass breakage.
- Seal failure.

Finish:

Manufacturer's standard finish warranty.

Products

Superstructure

Framing members shall be designed to elastic deflection limits of L/180 horizontally and vertically under design loading, based on IBC 2000

The enclosure and curtain wall shall withstand the deflection limit as stated above, its own weight, forces applied by the movement of the building structure and the maximum design loads due to the pressure and suction of wind, snow, ice and rain.

Design and construct to work to provide for expansion and contraction of components as will be caused by the ambient temperature range without causing buckling, failure of joint seals, undue stress on fasteners or other effects detrimental to appearance or performance.

Design aluminum structural components in accordance with applicable standards.

Aluminum: Members shall be of extruded aluminum members 6061 T6 and 6005 T5 Structural aluminum box beam superstructure.

Aluminum Flashings: Flashings shall be 0.040 in.

Screws and Fasteners:

- Assembly screws: series 410-H stainless steel, cadmium plated tek screws and sheet metal screws. Retaining cap and perlin screws to be 18-8 stainless steel screws.
- Structural bolts: series 304 high strength stainless steel finished to match color of framing.

Glazing

Overhead glazing:

1" (25mm) extruded solar grade TEN-wall polycarbonate. I.R. gold – R..value = 4.3

The roof will provide an overall class C rating as per ASTM E 108 standards and a Class B for Spread of Flame and Intermittent Flame as per ASTM E 108 (02), sections 7 and 8.

Vertical glazing:

1" sealed insulating glass units composed of:

1/8"-3/16" clear tempered
5/8" – 3/4" air space
1/8"-3/16" clear tempered

Swing Doors

Single action panic doors, standard aluminum stile and rail type and equipped with standard panic hardware. All aluminum materials under this section shall have a minimum thickness of 1/8" unless otherwise specified or indicated. Door stiles and rails shall be one (1) piece extruded aluminum sections with not less than 1/8" wall thickness, shall be reinforced and joined by means of concealed welding of machined aluminum corner reinforcements to the extruded sections. All doors shall be fully assembled in the factory and ready for installation prior to shipment.

Standard Hardware: Operating hardware shall be ball bearing butt hinges as supplied by the door manufacturer. Closers shall be door manufacturer's standard overhead closers. Exit devices shall be manufacturer's standard panic for the active leaf; includes cylinder, strike and pull handle. Rail sweep shall be manufacturer's standard door bottom.

Frame: 3'-4" or wide x 6'-10" or 7'-2" high aluminum door frame with a threshold.

Glazing:

- Doors to be glaze with 1" insulating glass composed of:
- ¼" clear tempered
- ½" air space
- ¼" clear tempered

Finish:

- Swing doors to be painted to match the enclosure.

Operable Windows

- Windows have thermally broken aluminum frames. The glazing shall be tempered insulated glass and will have removable screens. Operation will be sliding or crank awning type.

Motorized Roof

- Opening panels consist of glazed panels within a thermally isolated aluminum frame. The glazing shall be 25mm (1") bronze, opal or clear 5-wall polycarbonate.

Finish

- Baked enamel (duracron) white or dark bronze color.

SUBMITTALS

- Submit full scale shop drawings indicating methods of construction, location and spacing of anchorage, joinery, finishes, size, shape, thickness of framing members, relationship to adjoining work and glazing materials used.
- Submit samples of each type of glazing material and finish as required.

DELIVERY, STORAGE, AND HANDLING

- Deliver materials to site in manufacturer's original and unopened packaging.
- Store on site in a location and manner to avoid damage. Stacking shall be done in a manner that will prevent damage. Store material in a clean, dry location away from high traffic areas. Any protection on the products during transportation shall remain until installed.

Execution

Demolition and Removal Work

- Remove and properly dispose of existing blower.
- Saw cut existing concrete deck as needed for new foundations.
- Remove existing wooden structure and supports including the existing solar thermal panels and piping.

New Construction

- Install new concrete curb/foundation per local code requirements in effect at the time of contract signing
- Stainless steel wedge/expansion type anchors supplied by manufacturer.
- Fasteners by shall be 300 series stainless steel.
- Erection:
    - The manufacturer shall assist in the erection of the enclosure system in strict accordance with approved shop drawings as supplied by manufacturer. Fastening and sealing shall be in strict accordance with manufacturer's shop drawings and installation instructions. New aluminum shall be cleaned before sealants are applied.
- Cut existing concrete deck and install new footings. Patch and repair concrete areas damaged during foundation installation.
- Furnish and install one new pool enclosure per the specifications above.
- Furnish and install four (4) Reznor's UEAS or approved equal new natural gas unit heaters, each with an approximate capacity of 310,000 Btu/hr. The units shall be mounted and installed in accordance with the manufacture's requirements. The final design and heater sizing shall be completed by the design engineer.
- Furnish and install new LED lighting. The final lighting design shall be completed by the design engineer.
- Final cleaning and physical protection of the installed materials shall be completed.

City Responsibilities

- If installed at the time of construction, city shall be responsible for the removal and disposal of the existing fabric pool cover.
- City is responsible for any ADA code compliance requirements applicable to ECM 11a.

Inclusions, Exclusions and Assumptions Applicable to ECM 11a

Inclusions:

- All required cranes and rigging are included, with city coordination of street or parking lot traffic control and closures.
- Installation to be performed to mechanical, electrical, fire, local, state, national installation and operational codes in effect at the time of contract signing, including but not limited to the 2015 International Building Code.
- Obtain required licenses permits and inspections.

- Submit Operations and Maintenance (O&M) documentation in Adobe Acrobat® format.
- Structural analysis is included.
- Startup and checkout.

Exclusions:

- Repair or replacement of defective mechanical, electrical or controls equipment, except the equipment described in the FIM description. Johnson Controls will identify the location of defective equipment and notify City of Charleston.
- Repair or upgrades required due to bring adjacent controls, electrical and mechanical systems up to code.
- Overtime work caused by unforeseen circumstances beyond the control of Johnson Controls, such as or scheduling changes by City of Charleston. The cost difference between the overtime work wages and normal time work wages will be the responsibility of City of Charleston calculated as [(overtime rate – normal rate) x hours].
- Asbestos abatement and removal for this project is entirely the responsibility of City of Charleston. Johnson Controls is continuing to work with City of Charleston and our subcontractors to sufficiently identify the scope, costs and project scheduling implications of any required abatement such that City of Charleston can adequately plan for this requirement. If hazardous materials are encountered during the implementation phase, Johnson Controls will immediately stop work, take measures to reduce any contamination, and notify the City of Charleston facility manager of the possible hazardous material condition and location. Johnson Controls will then request that City of Charleston remove and dispose of the hazardous materials prior to any continuation of work. Hazardous materials encountered during the ongoing service phase of the project will remain the property and disposal responsibility of City of Charleston.
- The cost of hazardous material abatement or removal, such as asbestos, mold and lead paint that is not currently specified in the engineering scope of work. In the event hazardous materials are uncovered and abatement is beyond the ability of Johnson Controls to abate under this contract, the FIM will be evaluated for possible removal from the scope of work or the transfer of this responsibility to City of Charleston.
- Air balancing will be limited only to the equipment being replaced.
- Existing building ventilation conditions and indoor air quality issues (if any, except where it is was discussed with City of Charleston during development of project and documented above) are excluded from the scope and cost of this project.
- Temporary space conditioning, unless otherwise specified.
- ADA code compliance requirements
- Engineering services, studies or analysis associated with any exclusions or work clearly outside of the scope definition.

ECM 11b - Miscellaneous Upgrades - MLK POOL

Johnson Controls will designate $300,000 from the Contract Price set forth on Schedule 4-4 as an allowance to fund this ECM 11b. This ECM will include some or all of the miscellaneous upgrades to the existing MLK Pool building and surrounding area as set forth below and as directed by the City of Charleston's Parks Department.

Projects may include one or more of the following improvements:

- Retiling existing bathrooms.
- Addition of air conditioning to existing pool house.
- Removal and replacement of corroded electrical conduits, wiring and panels in existing chemical treatment room.
- Remove, repair or replace existing fence surrounding existing pool.
- Remove and disposal of existing equipment associated with existing inflatable dome.

The upgrades may consist of one or more improvements, depending on cost and available funds from the allowance. JCI agrees to implement the prescribed improvements that can be funded by the allowance, which may not necessarily include all of those listed, and agrees to show its labor, equipment and material costs on an open book basis for these specific improvements in accordance with JCI's labor and general conditions costs below plus overhead and profit at the same percentages defined in that certain Project Development Agreement by and between JCI and Customer dated March 28, 2017. To the extent that the total aggregate costs of the prescribed improvements in ECM 11b is less than $300,000, JCI will perform in-kind work and/or install additional improvements in Customer's facilities valued at the difference between the aggregate cost of these improvements and $300,000. The aggregate cost described herein shall include the costs of any engineering required.

JCI Labor Cost:	
Project Manager	$95/hr
Superintendent	$95/hr
Mechanical/Electrical Foreman	$80/hr
Mechanical/Electrical Labor	$68/hr
General Conditions Costs:	$875/day

Execution

The City of Charleston Parks Department will determine the order of priority for the improvements listed above for ECM 11b. Johnson Controls will obtain firm fixed prices on the work and present them to the City of Charleston. Upon written direction, Johnson Controls will execute the work in priority order up to the limit of the allowance.

ECM 13 - Window Replacement - ST JULIAN DEVINE

This ECM will replace five existing arched windows on the 3rd floor of St. Julian Devine with five (5) new windows of a similar look and configuration. This ECM will also replace the windows on the first and second floor with new windows of a similar look and configuration.

Demolition and Removal Work

- Demolish and properly dispose of five existing arched windows on the 3rd floor of St. Julian Devine.
- Demolish and properly dispose of windows on the first and second level not including the existing doors or sidelights.

New Installation Work

- Furnish and install new aluminum windows factory glazed with 3/4" Clear insulated SOLAR BAN 60 LOW-E glass with applied muntin grids and pre-set panning trim, with profiled exterior two piece snap trim, expanders and covers at adjacent surfaces all finished in 70% Kynar finish. Paint to match existing color
- Proposal consists of five windows in total for the third floor and the windows on the first and second floor.

Specific Inclusions:

- Removal and disposal of the existing aluminum sash for installation of new replacement windows utilizing existing window framing components.

Specific Exclusions:

- Lead or Asbestos abatement removal or abatement is not included.
- Cost of any field testing.
- Modifications required to due to existing code violations, including but not limited to the Americans with Disabilities Act (ADA) and egress, are the responsibility of the customer.
- The scope of work does not include the repair or installation of brick or other masonry materials/systems previously damaged

ECM 18 - Distributed Energy Storage - Greenberg Municipal Complex

General

This FIM is installed behind the electric utility meter tied the existing electric distribution system.

The Distributed Energy Storage System will be installed to implement the following strategies.

- Peak shaving - shave peaks of electric loads and manage demand
- Power factor improvement - improve power factor of electrical system

New Equipment

The system is comprised of a 250 kVA Inverter, 275 kVA Transformer, Utility Shadow Meter, Inverter output meter, and a containerized system including two (2) 92 kWh battery racks, lighting, access doors, controls, cooling system and a fire suppression system with the following specifications:

Battery Rack Specifications:

Characteristic	Power Rack	Units
Total Energy @ 25°C	92.3	kWh
Nominal Voltage	721	Vdc
Voltage Range	588 – 823	Vdc
Dimensions (W x H x D)	520 x 2000 x 670	mm
	20.5 x 78.7 x 26.4	inches
Weight	758	kg
	1671	lbs
Part Number	BU-100P	
Battery Cells per Rack	28	
Quantity of Racks	2	

Battery Cell Specifications:

Characteristic	Power Cell	Units
Capacity @ 25°C	63.9	Ah
Total Energy @ 25°C	234	Wh
Energy Density (gravimetric)	202	Wh/kg
Temperature Range	-30 to +60	°C
	-22 to +140	°F
Li Chemistry	NMC / Graphite	
Min Full Discharge Time	0.5	hrs
Min Full Charge Time	0.5	hrs

Power Conversion System (PCS) Specifications:

Characteristic	PCS 250	Units
Continuous Power	263/250	kVA/kW
Minimum Continuous	250	kVA @ 40°C
Frequency	50/60	Hz
Transformer	275	kVA
Utility Grid Connection	480 Vac, 60 Hz, 3P 4 wire WYE interconnection	

Containerized Energy Storage System Specification:

Characteristic	BUI 50P	Units
Nameplate Storage Capacity	184.6	kWh
Usable Storage Capacity	166.14	kWh
Maximum Charging Power	369.2	kW
Maximum Discharging Power	369.2	kW
Output Power	Dependent upon PCS selected	kW
DC Voltage Range	588 – 823	Vdc
AC Output Voltage	Dependent upon PCS selected	Vac
Aux Power Input	480/240 Vac,	
	3P, 60Hz,	
	10 kVA (max)	
Building Interface	JCI *Metasys*® system, ASHRAE BACnet®	
System Monitoring	Local and Remote	
Fire Detection	Tyco FAST2000™/2	
Fire Suppression	Novec™ 1230 Aerosol	
Operating Temperature	0 to +40 (Derating below +18 or above +28)	°C
	+32 to +104 (Derating below +64 or above +82)	°F
Operating Humidity	5% – 85% relative humidity, non-condensing	
Cooling System	2 Ton Unit	
Enclosure	E-10	

Characteristic	BU-150R	Units
Enclosure Dimensions (L,W,H)	10 x 8 x 8.5	ft
Approximate Weight	3800	lbs

Scope of Work

- Apply for an Interconnection Agreement with the Electric Utility.
- Engineer, furnish and install new elevated structure and foundation for placement of the Containerized Energy Storage System.
- Provide and install new PCS Inverter indoors near to the interconnection point.
- Provide and install new Facility Shadow Meter at main service point.
- Provide and install new BU-150 on the 6-foot elevated structure and foundation.
- Install DC wire and conduit from the BU-150 from outdoors to the indoor PCS-250 installation location.
- Install AC wire, conduit and overcurrent protection for the BU-150 auxiliary power from an existing panel in the facility to the BU-150.
- Install communications conduit and wire from the New Facility Shadow Meter to the BU-150.
- Install AC wire, conduit, and overcurrent protection between PCS-250 and the point of connection with the building distribution system.
- Startup, checkout and verify full range of operation and control features per startup and checkout procedures.
- Clean up of all job related debris daily. Clean up and store tools, equipment, etc. daily and remove after successful installation and operational checkout.
- Program new sequences and setpoints for optimal operation.

Inclusions, Exclusions and Assumptions:

Inclusions:

- All required cranes and rigging are included, with city coordination of street or parking lot traffic control and closures.
- Installation to be performed to mechanical, electrical, fire, local, state, national installation and operational codes in effect at the time of contract signing.
- Obtain all required licenses permits and inspections.
- Submit Operations and Maintenance (O&M) documentation in Adobe Acrobat® format.
- Structural analysis is included.
- Startup and checkout.
- Fees associated with utility interconnection studies or interconnection approval.

Exclusions:

- Network Interconnection. To provide remote monitoring and integration into in a building control system, a network interconnection to the facility network or the global internet is required. The DESS shall be located where there is the ability to extend network access. A minimum of 10Mbps Ethernet CAT5 connection is required with the ability to deliver 20G bits of data per month.
- For the location in which the PCS-250 Inverter is placed inside of the building, sufficient cooling for the room must me capable of maintaining 35 DegC or less ambient temperature.
- Structural modification to any existing structures is excluded from this scope of work unless covered under separate contract.
- Repair or replacement of defective mechanical, electrical or controls equipment, or the electrical distribution system, except the equipment described in the FIM description. Johnson Controls will identify the location of defective equipment and notify the City of Charleston.
- Repair or upgrades required due to bring adjacent controls, electrical and mechanical systems up to code.
- Overtime work caused by unforeseen circumstances beyond the control of Johnson Controls, such as or scheduling changes by customer. The cost difference between the overtime work wages and normal time work wages will be the responsibility of customer calculated as [(overtime rate – normal rate) x hours].
- Asbestos abatement and removal for this project is entirely the responsibility of City of Charleston. Johnson Controls is continuing to work with City of Charleston and our subcontractors to sufficiently identify the scope, costs and project scheduling implications of any required abatement such that City of Charleston can adequately plan for this requirement. If hazardous materials are encountered during the implementation phase, Johnson Controls will immediately stop work, take measures to reduce any contamination, and notify the City of Charleston facility manager of the possible hazardous material condition and location. Johnson Controls will then request that City of Charleston remove and dispose of the hazardous materials prior to any continuation of work. Hazardous materials encountered during the ongoing service phase of the project will remain the property and disposal responsibility of City of Charleston.
- The cost of hazardous material abatement or removal, such as asbestos, mold and lead paint that is not currently specified in the engineering scope of work. In the event hazardous materials are uncovered and abatement is beyond the ability of Johnson Controls to abate under this contract, the FIM will be evaluated for possible removal from the scope of work or the transfer of this responsibility to City of Charleston.
- Engineering services, studies or analysis associated with any exclusions or work clearly outside of the scope definition.

Warranty

- Degradation warranty for power cells and racks – three year standard warranty included from FIM acceptance.
- Inverter Warranty Standard 5 year warranty included

ECM 19 - SCE&G Billing Error Correction - Greenberg

General

A billing error was identified during the analysis of utility bills for the Greenberg Complex. The billing error appeared to be caused due to electric meter change-out by SCE&G in the month of July-2016. The monthly billing demand for that month was calculated by adding kVA from both old and new meters instead of taking larger of the two, as listed below:

	Meter#	Demand (kVA)	
New Meter Demand	002217929	542	[A]
Old Meter Demand	002217938	278	[B]
Monthly Billed Demand (July-2016)		820	[C]= [A] + [B]

This error not only caused overbilling in the month of July-2016 but it was carried over for next several months before it was reported. SCE&G acknowledged and issued a credit in the amount of $34,196.26 on the May-2017 bill for the overbilling that occurred until then. This billing error would have persisted next 12 months if it had not been identified and reported.

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CUSTOMER SERVICE
1-800-251-7234

ACCOUNT NUMBER
0-1898-0003-2261

STATEMENT DATE
May 30 2017

Payment Options

By Mail: Pay by check or money order in the enclosed envelope.

Online: Visit sceg.com to pay directly from your bank account or credit card.

By Phone: Call 1-800-450-9160, toll-free, 24 hours a day to pay using your credit card, debit card or directly from your bank account. There is a fee of $3.50 per transaction that BillMatrix receives for providing this service. Additional limitations may apply.

Business Office:
MT PLEASANT OFFICE, 1277 CHUCK DAWLEY BLVD, MT PLEASANT SC 29464

Authorized Payment Agencies:
Visit an authorized payment location near you to pay in person. There is no fee associated with service at an authorized payment location.

PIGGLY WIGGLY #182, 8780 RIVERS AVE, NORTH CHARLESTON SC 29406

R&S WHOLESALE, 4318 RIVERS AVE, N CHARLESTON SC 29405

ALL SC AND NC WALMARTS

Unauthorized Payment Agencies:
Additional payment centers may exist in your area that are not SCE&G authorized payment locations. While these unauthorized locations may accept your SCE&G payment, they will charge a fee for doing so, and your payment will be delayed in reaching SCE&G.

Gas Charges

RATE PLAN
031 - Firm General Gas Service

METER READING
Gas Meter read on 05/25/17 at 09:34 am
(Next scheduled read date 6/27/17)

METER NUMBER
001184034

BILLING PERIOD	DAYS	CURRENT		PREVIOUS	P-COMP		USAGE(CCF)		BTU FACTOR	THERMS
4/25/17 - 5/25/17	30	(31640	-	31640)	X 1.13374	=	0	X	1.0300	= 0

Base - 0 Therms X $ 1.029000	0.00
State Sales Tax at 9.00 %	1.63
Total Gas Charges	**$19.78**

Other Charges & Credits

Adjustment for Prior Months	-34,196.26
Transfer to Acct #0-1898-0000-8474	12,845.57
Total Other Charges & Credits	**-$21,350.69**

Electronic check conversion. When you provide a check as payment, you authorize us either to use information from your check to make a one-time electronic fund transfer from your account or to process the payment as a check transaction.

Refer to Exhibit 1, ECM 19 for detailed information on estimated overbilling over the 12-month period.

ASSURED PERFORMANCE GUARANTEE

I. PROJECT BENEFITS

A. **Certain Definitions.** For purposes of this Agreement, the following terms have the meanings set forth below:

Annual Project Benefits are the portion of the projected Total Project Benefits to be achieved in any one year of the Guarantee Term.

Annual Project Benefits Realized are the Project Benefits actually realized for any one year of the Guarantee Term.

Annual Project Benefits Shortfall is the amount by which the Annual Project Benefits exceed the Annual Project Benefits Realized in any one year of the Guarantee Term.

Annual Project Benefits Surplus is the amount by which the Annual Project Benefits Realized exceed the Annual Project Benefits in any one year of the Guarantee Term.

Baseline is the mutually agreed upon data and/or usage amounts that reflect conditions prior to the installation of the Improvement Measures as set forth in Section IV below.

Guarantee Term will commence on the first day of the month next following the Substantial Completion date and will continue through the duration of the M&V Services, subject to earlier termination as provided in this Agreement.

Installation Period is the period beginning on JCI's receipt of Customer's Notice to Proceed and ending on the commencement of the Guarantee Term.

Measured Project Benefits are the utility savings and cost avoidance calculated in accordance with the methodologies set forth in Section III below.

Non-Measured Project Benefits are identified in Section II below. The Non-Measured Project Benefits have been agreed to by Customer and will be deemed achieved in accordance with the schedule set forth in the Total Project Benefits table below. Customer and JCI agree that: (i) the Non-Measured Project Benefits may include, but are not limited to, future capital and operational costs avoided as a result of the Work and implementation of the Improvement Measures, (ii) achievement of the Non-Measured Project Benefits is outside of JCI's control, and (iii) Customer has evaluated sufficient information to conclude that the Non-Measured Project Benefits will occur and bears sole responsibility for ensuring that the Non-Measured Project Benefits will be realized. Accordingly, the Non-Measured Project Benefits shall not be measured or monitored by JCI at any time during the Guarantee Term, but rather shall be deemed achieved in accordance with the schedule set forth in the Total Project Benefits table below.

Project Benefits are the Measured Project Benefits plus the Non-Measured Project Benefits to be achieved for a particular period during the term of this Agreement.

Total Project Benefits are the projected Project Benefits to be achieved during the entire term of this Agreement.

B. **Project Benefits Summary.** Subject to the terms and conditions of this Agreement, JCI and Customer agree that Customer will be deemed to achieve a total of $7,389,188 in Non-Measured Project Benefits and JCI guarantees that Customer will achieve a total of $9,643,743 in Measured Project Benefits during the term of this Agreement, for Total Project Benefits of $17,032,931 as set forth in the Total Project Benefits table below.

Total Project Benefits

Year	Utility Cost Avoidance*	Operations & Maintenance Cost Avoidance**	Future Capital Cost Avoidance**	Annual Project Benefits
Installation Period	$175,043	$0	$0	$175,043
1	$553,649	$89,659	$381,442	$1,024,750
2	$521,765	$92,349	$381,442	$995,556
3	$537,418	$95,119	$381,442	$1,013,979
4	$553,541	$97,973	$381,442	$1,032,955
5	$570,147	$100,912	$381,442	$1,052,501
6	$587,251	$103,939	$381,442	$1,072,633
7	$604,869	$107,057	$381,442	$1,093,368
8	$623,015	$110,269	$381,442	$1,114,726
9	$641,706	$113,577	$381,442	$1,136,725
10	$660,957	$116,985	$381,442	$1,159,383
11	$680,785	$120,494	$381,442	$1,182,721
12	$701,209	$124,109	$381,442	$1,206,760
13	$722,245	$127,832	$381,442	$1,231,519
14	$743,913	$131,667	$381,442	$1,257,022
15	$766,230	$135,617	$381,442	$1,283,289
Total	**$9,643,743**	**$1,667,559**	**$5,721,629**	**$17,032,931**

*Utility Cost Avoidance is a Measured Project Benefit. Utility Cost Avoidance figures in the table above are based on anticipated increases in unit energy costs as set forth in the table in Section IV below.

** Operations & Maintenance Cost Avoidance and Future Capital Cost Avoidance are Non-Measured Project Benefits. Operations & Maintenance Cost Avoidance and Future Capital Cost Avoidance figures in the table above are based on a mutually agreed fixed annual escalation rate of 3% for Operations & Maintenance Cost Avoidance and 0% for Future Capital Cost Avoidance.

Within sixty (60) days of the commencement of the Guarantee Term, JCI will calculate the Measured Project Benefits achieved during the Installation Period plus any Non-Measured Project Benefits applicable to such period and advise Customer of same. Any Project Benefits achieved during the Installation Period may, at JCI's discretion, be allocated to the Annual Project Benefits for the first year of the Guarantee Term. Within sixty (60) days of each anniversary of the commencement of the Guarantee Term, JCI will calculate the Measured Project Benefits achieved for the applicable year plus any Non-Measured Project Benefits applicable to such period and advise Customer of same.

Customer acknowledges and agrees that if, for any reason, it (i) cancels or terminates receipt of M&V Services, (ii) fails to pay for M&V Services in accordance with Schedule 4, (iii) fails to fulfill any of its responsibilities necessary to enable JCI to complete the Work and provide the M&V Services, or (iv) otherwise cancels, terminates or materially breaches this Agreement, the Assured Performance Guarantee shall automatically terminate and JCI shall have no liability hereunder.

C. **Project Benefits Shortfalls or Surpluses.**

(i) *Project Benefits Shortfalls*. If an Annual Project Benefits Shortfall occurs for any one year of the Guarantee Term, JCI shall, at its discretion and in any combination, (a) set off the amount of such shortfall against any unpaid balance Customer then owes to JCI, (b) where permitted by applicable law, increase the next year's amount of Annual Project Benefits by

the amount of such shortfall, (c) pay to Customer the amount of such shortfall, or (d) subject to Customer's agreement, provide to Customer additional products or services, in the value of such shortfall, at no additional cost to Customer.*

(ii) *Project Benefits Surpluses*. If an Annual Project Benefits Surplus occurs for any one year of the Guarantee Term, JCI may, at its discretion and in any combination, (a) apply the amount of such surplus to set off any subsequent Annual Project Benefit Shortfall during the Guarantee Term, or (b) bill Customer for the amount of payments made pursuant to Section C(i)(c) above and/or the value of the products or services provided pursuant to clause C(i)(d) above, in an amount not to exceed the amount of such surplus.*

(iii) *Additional Improvements*. Where an Annual Project Benefits Shortfall has occurred, JCI may, subject to Customer's approval (which approval shall not be unreasonably withheld, conditioned, or delayed), implement additional Improvement Measures, at no cost to Customer, which may generate additional Project Benefits in future years of the Guarantee Term.

II. NON-MEASURED PROJECT BENEFITS

Operating and Capital Cost Avoidance Summary

ECM	O&M Cost	Annualized O&M Sav	A/P Factor*	Equipment Life	Annualized Cost
ECM 1 - Interior Lighting Upgrades and Controls - 72 Buildings		$ 10,887			$ -
ECM 2a - Parking Garage Lighting - PARKING GARAGE - CAMDEN EXCHANGE		$ 928	0.08377	15	$ 15,132
ECM 2b - Parking Garage Lighting - PARKING GARAGE - CHARLESTON PLACE		$ 675	0.08377	15	$ 11,005
ECM 2c - Parking Garage Lighting - PARKING GARAGE - CONCORD		$ 703	0.08377	15	$ 11,464
ECM 2d - Parking Garage Lighting - PARKING GARAGE - GAILLARD		$ 755	0.08377	15	$ 12,324
ECM 2e - Parking Garage Lighting - PARKING GARAGE - LIBERTY & ST PHILLIPS		$ 594	0.08377	15	$ 9,687
ECM 2f - Parking Garage Lighting - PARKING GARAGE - MAJESTIC SQUARE		$ 741	0.08377	15	$ 12,094
ECM 2g - Parking Garage Lighting - PARKING GARAGE - MARION SQUARE		$ 460	0.08377	15	$ 7,337
ECM 2h - Parking Garage Lighting - PARKING GARAGE â€" QUEEN ST		$ 651	0.08377	15	$ 5,125
ECM 2i - Parking Garage Lighting - PARKING GARAGE - SC AQUARIUM		$ 2,632	0.08377	15	$ 42,932
ECM 2j - Parking Garage Lighting - PARKING GARAGE - VRTC		$ 2,008	0.08377	15	$ 30,902
ECM 2l - Parking Garage Lighting - PARKING GARAGE - PRIOLEAU & EAST BAY		$ 534	0.08377	15	$ 8,713
ECM 3a - HVAC Building Controls Improvements - 18 Facilities					$ -
ECM 3b - HVAC Building Controls Fire Stations - 14 Fire Stations					$ -
ECM 4 - R22 Equipment Replacement - 19 Facilities	$ 51,975	$ 3,465	0.08377	15	$ 62,266
ECM 5a - Ground Loop Improvements - City Hall			0.06722	20	$ 11,529
ECM 5b - Control Improvements - City Hall					$ -
ECM 6a -VRF HVAC System Upgrades - Joe Riley Ballpark	$ 24,570	$ 1,638	0.06722	20	$ 47,050
ECM 7a - HVAC Controls Improvements - Greenberg Municipal Complex					$ -
ECM 7b - HVAC Equipment Replacement - Greenberg Municipal Complex	$ 18,113	$ 1,208	0.06722	20	$ 14,339
ECM 8a - Dual Duct Box Replacement - POLICE STATION			0.06722	20	$ 12,244
ECM 8b - Chiller Replacement - POLICE STATION	$ 26,775	$ 1,785	0.06722	20	$ 10,440
ECM 8c - AHU2 System Improvement - POLICE STATION			0.06722	20	$ 5,317
ECM 9 - Chiller Replacement - DOCK STREET THEATER	$ 19,530	$ 1,302	0.06722	20	$ 16,929
ECM 10 - Chiller Replacement - VRTC - DEAN BUILDING	$ 16,380	$ 1,092	0.06722	20	$ 7,156
ECM 11a - Pool Enclosure and Upgrade - MLK POOL		$ 55,000			$ -
ECM 11b - Misc Upgrades - MLK POOL			0.06722	20	$ 13,940
ECM 13 - Window Replacement - ST JULIAN DEVINE			0.06722	20	$ 13,518
ECM 18 - Distributed Energy Storage - Greenberg Municipal Complex					$ -
ECM 19 - SCE&G Billing Error Correction - Greenberg					$ -
Total	$ 157,343	$ 87,048			$ 381,442

Factor	Name	Formula	Purpose
$(A/P, i, N)$	Capital Recovery Factor	$\frac{i(i+1)^N}{(1+i)^N - 1}$	Takes a single payment and spreads it into a uniform series over N later periods. The first payment in the series occurs one period later than P.

Customer agrees that the Non-Measured Project Benefits are reasonable and that the installation of the Improvement Measures will enable Customer to take actions that will result in the achievement of such Non-Measured Project Benefits.

Annualized Future Capital Avoidance

Annualized Future Capital Avoidance has been estimated as follows:

(Equipment Cost + Installation Cost)*Capital Recovery Factor where N = the anticipated equipment life

Lighting Material (ECM 1 & 2)

The City of Charleston shall see a reduction in the cost of lighting materials as a direct result of the implementation of ECM 1 and 2. O&M cost avoidance for lighting materials derive from the installation of new lighting equipment which include cost avoidance from reduced expenses for lamps and ballasts realized as a result of the replacement of existing fluorescent lamps with LED lamps and the elimination of existing ballast materials. LED lamps have longer rated lives with warranties as indicated in the warranty submittal.

Material savings were calculated by the following equation:

((Old lamp cost/3-year life) + (old ballast/5-year life))*Quantity of fixtures = Material Savings

R22 Replacement

ECM 4 - R22 Equipment Replacement
ECM 6a -VRF HVAC System Upgrades - Joe Riley Ballpark
ECM 7a - HVAC Controls Improvements - Greenberg Municipal Complex
ECM 7b - HVAC Equipment Replacement - Greenberg Municipal Complex
ECM 8a - Dual Duct Box Replacement - POLICE STATION
ECM 8b - Chiller Replacement - POLICE STATION
ECM 8c - AHU2 System Improvement - POLICE STATION
ECM 9 - Chiller Replacement - DOCK STREET THEATER
ECM 10 - Chiller Replacement - VRTC - DEAN BUILDING

The City of Charleston shall see a reduction in expenses associated with providing R22 refrigerate as a direct result of the implementation of these ECMs. R22 refrigerant is in the process of being phased out under the Montreal Protocol. As a result, the City of Charleston as seen a steep increase in the cost of R22 refrigerant which is expected to accelerate as the phase-out deadline approaches.

JCI modeled the R22 refrigerant savings by creating a model of current refrigeration usage that factors in the amount of refrigerant per system, the expected repair or replacement interval, the life span of the equipment and the current cost of R22 refrigerant. Calculations are included below:

ECM 4	Value	Notes	Annualized
# of Units	66	2-4 lbs per ton on cooling	
Avg. Cooling Capacity	5		
Refrigerant lbs per ton of cooling	3		
Cost of R22	$ 25	per lb	
Replace Frequency	7	years	
Total Tons	330		
Total lbs of Refrigerant	990		
Average Life of Equipment	15	years	
Refrigerant re-charge over the life of equipment	2		
Total lbs of Refrigerant	2,121		
Total Estimated Cost of Refrigerant	$ 51,975		$ 3,465

ECM 6a	Value	Notes	Annualized
# of Units	24	2-4 lbs per ton on cooling	
Avg. Cooling Capacity	6.5		
Refrigerant lbs per ton of cooling	3		
Cost of R22	$ 25	per lb	
Replace Frequency	7	years	
Total Tons	156		
Total lbs of Refrigerant	468		
Average Life of Equipment	15	years	
Refrigerant re-charge over the life of equipment	2		
Total lbs of Refrigerant	1,003		
Total Estimated Cost of Refrigerant	$ 24,570		$ 1,638.00

ECM 7b	Value	Notes	Annualized
# of Units	4	2-4 lbs per ton on cooling	
Avg. Cooling Capacity			
Refrigerant lbs per ton of cooling	3		
Cost of R22	$ 25	per lb	
Replace Frequency	7	years	

ECM 7b	Value	Notes	Annualized
Total Tons	115		
Total lbs of Refrigerant	345		
Average Life of Equipment	15	years	
Refrigerant re-charge over the life of equipment	2		
Total lbs of Refrigerant	739		
Total Estimated Cost of Refrigerant	$ 18,113		$ 1,207.50

ECM 8b	Value	Notes	Annualized
# of Units	1	2-4 lbs per ton on cooling	
Avg. Cooling Capacity			
Refrigerant lbs per ton of cooling	3		
Cost of R22	$ 25	per lb	
Replace Frequency	7	years	
Total Tons	170		
Total lbs of Refrigerant	510		
Average Life of Equipment	15	years	
Refrigerant re-charge over the life of equipment	2		
Total lbs of Refrigerant	1,093		
Total Estimated Cost of Refrigerant	$ 26,775		$ 1,785.00

ECM 9	Value	Notes	Annualized
# of Units	1	2-4 lbs per ton on cooling	
Avg. Cooling Capacity			
Refrigerant lbs per ton of cooling	3		
Cost of R22	$ 25	per lb	
Replace Frequency	7	years	
Total Tons	124		
Total lbs of Refrigerant	372		
Average Life of Equipment	15	years	
Refrigerant re-charge over the life of equipment	2		
Total lbs of Refrigerant	797		
Total Estimated Cost of Refrigerant	$ 19,530		$ 1,302.00

ECM 10	Value	Notes	Annualized

# of Units	1	2-4 lbs per ton on cooling	
Avg. Cooling Capacity			
Refrigerant lbs per ton of cooling	3		
Cost of R22	$ 25	per lb	
Replace Frequency	7	years	
Total Tons	104		
Total lbs of Refrigerant	312		
Average Life of Equipment	15	years	
Refrigerant re-charge over the life of equipment	2		
Total lbs of Refrigerant	669		
Total Estimated Cost of Refrigerant	$ 16,380		$ 1,092.00

ECM 11a - Pool Enclosure and Upgrade - MLK POOL

The City of Charleston shall see a reduction in operating and maintenance expenses associated with replacing the existing removable fabric pool cover with a fixed pool enclosure. A summary of those expense reduction is as noted below:

Operating and Maintenance Expenses	Cost Avoidance	Notes
Maintenance on dome equipment	$ 5,500	
Dome transportation	$ 4,500	
Maintenance on dome	$ 5,000	
Dome storage	$ 10,000	50'x50' space at $4.00/sf
Solar thermal maintenance	$ 25,846	
Cost of water to fill (need to empty to take down cover)	$ 4,154	
	$ 55,000	

III. MEASUREMENT AND VERIFICATION METHODOLOGIES

The following is a brief overview of the measurement and verification methodologies applicable to the Improvement Measures set forth below. JCI shall apply these methodologies, as more fully detailed in the guidelines and standards of the International Measurement and Verification Protocol (IPMVP), in connection with the provision of M&V Services hereunder.

Option A
Retrofit Isolation: Key Parameter Measurement

Measured Project Benefits are determined by partial field measurement of the energy use of the system(s) to which an Improvement Measure was applied separate from the energy use of the rest of the facility. Measurements may short-term, long-term, or continuous.

Partial measurement means that some but not all parameters will be measured. Careful review of the design and installation of Improvement Measures is intended to demonstrate that the stipulated values fairly represent the probable actual values. Agreed-upon values will be shown in the measurement and verification plan. Engineering calculations using measurements and stipulations are used to calculate Measured Project Benefits for the duration of the Guarantee Term.

Measured Project Benefits associated with the following Improvement Measures will be calculated using Option A:

ECM 2 - Parking Garage Lighting
ECM 3a - HVAC Building Controls Improvements
ECM 3b - HVAC Building Controls Fire Stations
ECM 4 - R22 Equipment Replacement
ECM 5a - Ground Loop Improvements - City Hall
ECM 5b - Control Improvements - City Hall
ECM 6a -VRF HVAC System Upgrades - Joe Riley Ballpark
ECM 7a - HVAC Controls Improvements - Greenberg Municipal Complex
ECM 7b - HVAC Equipment Replacement - Greenberg Municipal Complex
ECM 8a - Dual Duct Box Replacement - POLICE STATION
ECM 8b - Chiller Replacement - POLICE STATION
ECM 8c - AHU2 System Improvement - POLICE STATION
ECM 9 - Chiller Replacement - DOCK STREET THEATER
ECM 10 - Chiller Replacement - VRTC - DEAN BUILDING
ECM 13 - Window Replacement - ST JULIAN DEVINE
ECM 18 - Distributed Energy Storage - Greenberg Municipal Complex

Option B
Retrofit Isolation: All Parameter Measurement

Measured Project Benefits are determined by field measurement of the energy use of the systems to which an Improvement Measure was applied separate from the energy use of the rest of the facility. Short-term, long-term or continuous measurements are taken throughout the pre and post-retrofit periods. Engineering calculations using short term, long-term or continuous pre and post-retrofit measurements are used to calculate the Measured Project Benefits for the duration of the Guarantee Term.

Measured Project Benefits associated with the following Improvement Measures will be calculated using Option B:

ECM 1 - Interior Lighting Upgrades and Controls

Option C
Whole Facility

Option C involves use of utility meters or whole building sub-meters to assess the energy performance of a total building. Option C assesses the impact of any type of Improvement Measure, but not individually if more than one is applied to an energy meter. This option determines the collective Measured Project Benefits of all Improvement Measures applied to the part of the facility monitored by the energy meter. Also, since whole building meters are used, Measured Project Benefits reported under Option C include the impact of any other change made in facility energy use (positive or negative).

Measured Project Benefits associated with the following Improvement Measures will be calculated using Option C:

ECM 11a - Pool Enclosure and Upgrade - MLK POOL

Option D
Calibrated Simulation

Option D involves the use of computer simulation software to predict energy use. Such simulation model must be "calibrated" so that it predicts an energy use and demand pattern that reasonably matches actual utility consumption and demand data from either the base-year or a post-retrofit year.

Option D may be used to assess the performance of all Improvement Measures in a facility, akin to Option C. However, different from Option C, multiple runs of the simulation tool in Option D allow estimates of the Measured Project Benefits attributable to each Improvement Measure within a multiple Improvement Measure project.

Option D may also be used to assess just the performance of individual systems within a facility, akin to Options A and B. In this case, the system's energy use must be isolated from that of the rest of the facility by appropriate meters.

Measured Project Benefits associated with the following Improvement Measures will be calculated using Option D:

None

CHANGES IN USE OR CONDITION; ADJUSTMENT TO BASELINE AND/OR ANNUAL PROJECT BENEFITS

Customer agrees to notify JCI, within fourteen (14) days, of (i) any actual or intended change, whether before or during the Guarantee Term, in the use of any facility, equipment, or Improvement Measure to which this Schedule applies; (ii) any proposed or actual expansions or additions to the premises or any building or facility at the premises; (iii) a change to utility services to all or any portion of the premises; or (iv) any other change or condition arising before or during the Guarantee Term that reasonably could be expected to change the amount of Project Benefits realized under this Agreement.

Such a change, expansion, addition, or condition would include, but is not limited to: (a) changes in the primary use of any facility, Improvement Measure, or portion of the premises; (b) changes to the hours of operation of any facility, Improvement Measure, or portion of the premises; (c) changes or modifications to the Improvement Measures or any related equipment; (d) changes to the M&V Services provided under this Agreement; (e) failure of any portion of the premises to meet building codes; (f) changes in utility suppliers, utility rates, method of utility billing, or method of utility purchasing; (g) insufficient or improper maintenance or unsound usage of the Improvement Measures or any related equipment at any facility or portion of the premises (other than by JCI); (h) changes to the Improvement Measures or any related equipment or to any facility or portion of the premises required by building codes or any governmental or quasi-governmental entity; or (i) additions or deletions of Improvement Measures or any related equipment at any facility or portion of the premises.

Such a change or condition need not be identified in the Baseline in order to permit JCI to make an adjustment to the Baseline and/or the Annual Project Benefits. If JCI does not receive the notice within the time period specified above or travels to either Customer's location or the project site to determine the nature and scope of such changes, Customer agrees to pay JCI, in addition to any other amounts due under this Agreement, the applicable hourly consulting rate for the time it took to determine the changes and to make any adjustments and/or corrections to the project as a result of the changes, plus all reasonable and documented out-of-pocket expenses, including travel costs. Upon receipt of such notice, or if JCI independently learns of any such change or condition, JCI shall calculate and send to Customer a notice of adjustment to the Baseline and/or Annual Project Benefits to reflect the impact of such change or condition, and the adjustment shall become effective as of the date the change or condition first arose. Should Customer fail to promptly provide JCI with notice of any such change or condition, JCI may make reasonable estimates as to the impact of such change or condition and as to the date on which such change or condition first arose in calculating the impact of such change or condition, and such estimates shall be conclusive.

Description of Measurement and Verification Methodologies by ECMs:

ECM 1 - Interior Lighting Upgrades and Controls

The savings associated with this ECM will be verified using IPMVP VOLUME I, EVO 10000 – 1:2012, Option B, Retrofit Isolation with All Parameter Measurement. The savings for this ECM are generated through a reduction in energy used by the lighting system; therefore, the measurement boundary is the lighting system itself.

Key Parameter	Measurement Frequency	Measurement Description
Pre- and Post-retrofit Fixture Power Draw (kW)	One-time	The measured post-retrofit lighting fixture wattages from the last phase (Phase II) of the Performance Contract were used as pre-retrofit fixture wattages for this phase. Measured wattages were used when possible. In some situations, such as when a certain type of lighting fixture was not available by itself on a switch, typical wattages as published by ANSI (American National Standards Institute) were used. The post-retrofit wattage of the impacted fixtures will be measured one time on a sample of fixtures meeting the same sampling criteria. The savings will be updated.
Burn Hours	Short-term	Mutually agreed burn hours by predominant space types from the last phase (Phase II) of the Performance Contract were used for this phase. The table below shows the average annual baseline burn hours by space type. These values will not be measured again.
Coincident Factor	Short Term	The coincident factor is calculated based on the number of fixtures in a given space type that were logged to be operating at the same time during the on peak period and is agreed to remain at the same value after the retrofit. The coincident factors by room/space types are as listed in the table below with pre and post burn hours.

Following table summarizes existing fixture codes and corresponding average power draws.

Existing Component Code	Existing Fix Qty.	Exist System Wattage
2X28T8EBN	2,258	42.0
3X28T8EBN	703	64.0
4X28T8EBN	590	84.0

Existing Component Code	Existing Fix Qty.	Exist System Wattage
2X32T8U6EBN	437	59.0
1X13CFLSI	403	12.7
1X40INCA	364	40.0
1X1000MH	357	1,080.0
1X32CFL4P	325	35.5
1X26CFL4P	322	29.0
1X250MH	302	295.0
1X23CFLSI	230	23.0
1X74LEDF	218	0.0
2X28T8EBN	214	0.0
1X150MH	212	181.1
1X18CFLSI	185	18.0
1X75INCA	179	75.0
1X60INCA	159	60.0
1X50HAL	148	50.0
2X34T12MB	145	0.0
2X34T12MB	137	72.0
1X3LEDEXIT	136	3.0
1X10LEDF	128	10.0
2X26CFL4P	128	51.0
1X25INCA	119	25.0
6X28T8EBHEL2	117	126.0
1X400MH	110	459.9
1X100MH	108	126.1
1X75HAL	106	75.0
1X15LEDSI	99	15.0
3X28T8EBN2	96	76.0
2X40CFLBX	90	85.0
2X17T8EBN	69	33.0
2X60T12SLMB	76	123.0
3X17T8EBN	76	47.0
4X34T12MB2	74	144.0
1X24CFLBX	71	32.0
2X32T8EBN	71	58.4
1X1500MH	68	1,610.0
3X25INCA	66	75.0
1X175MH	63	215.0
1X5LEDSI	64	5.0
4X34T12MB	64	144.0
1X28T8EBN	57	26.0
2X100INCA	55	200.0
1X40HAL	54	40.0
2X20INCEXIT	54	40.0

Existing Component Code	Existing Fix Qty.	Exist System Wattage
3X40CFLBX	54	133.0
1X10LEDSI	53	10.0
1X400HPS	50	463.2
1X70MH	45	95.0
2X34T12U6MB	43	84.0
1X17LEDSI	42	17.0
2X22CFL2P	40	54.0
6X28T8EBHEL2	38	0.0
4X28T8EBN2	37	99.0
1X250HAL	30	250.0
1X45HAL	30	45.0
1X50MH	30	64.0
1X5LEDF	30	5.0
2X13CFLSI	30	26.0
3X40INCA	30	120.0
1X13CFLSI	26	0.0
1X200LEDF	24	0.0
8X40CFLBX	24	280.0
1X40CFLBX	22	46.0
4X40INCA	22	160.0
1X3LEDEXIT	21	0.0
1X250HPS	20	293.3
1X300HAL	14	300.0
1X70HPS	19	95.0
2X23CFLSI	17	46.0
1X150HPS	12	186.2
1X40LEDF	16	40.0
4X18CFLSI	16	72.0
1X30LEDF	14	30.0
1X50LEDF	14	50.0
6X54T5HOEBHPS2	14	362.0
2X40INCA	13	80.0
1X300LEDF	12	300.0
2X42CFL4P	12	93.0
2X54T5HOEBHPS	12	117.0
2X60INCA	11	120.0
3X28T8EBN	11	0.0
DRINK	11	400.0
4X60T12SLMB2	9	246.0
1X150HPS	8	0.0
1X60INCA	8	0.0
2X18CFLSI	8	36.0
4X28T8EBN	8	0.0

Existing Component Code	Existing Fix Qty.	Exist System Wattage
1X13CFLGU24	7	13.0
1X17T8EBN	7	20.0
1X20LEDF	7	20.0
1X500INCA	7	500.0
3X60INCA	7	180.0
1X100LEDF	6	100.0
1X18CFLSI	6	0.0
1X18CFQ2P	6	26.0
1X34T12MB	6	43.0
1X54T5HOEBHPS	6	64.0
2X26CFL2P	6	51.0
3X13CFlSI	6	39.0
1X175MV	5	205.0
1X7CFL2P	5	10.0
1X7LEDF	5	7.0
2X9CFLEXIT	5	20.0
2XLEDT4FT-L	5	28.0
3X18CFLSI	5	54.0
4X32T8EBN	5	113.3
4X60INCA	5	240.0
1X13CFQ2P	4	17.0
1X26CFL4P	4	0.0
1X80LEDF	4	80.0
2X32CFL2P	4	62.0
4X54T5HOEBHPS2	4	234.0
SNACK	4	180.0
1X100HPS	3	138.0
1X26CFL2P	3	32.0
1X32CIRCMB	3	31.0
1X50HPS	3	66.0
1X6LEDSI	3	6.0
2X13CFL2P	3	31.0
2X14T5EBHPS	3	33.0
3X60T12SLMB	3	210.0
1X175MH	2	0.0
1X18CFLBX	2	24.0
1X23CFLSI	2	0.0
1X25T8EBN	2	24.0
1X32T8EBN	2	27.0
2X10LEDSI	2	20.0
2X17T8EBN	2	0.0
2X7CFL2P	2	21.0
3X23CFLSI	2	69.0

Existing Component Code	Existing Fix Qty.	Exist System Wattage
4X17T8EBN	2	0.0
1X28T8EBN	1	0.0
1X41LEDF	1	41.0
2X20T12MB	1	50.0
2X25T8EBN	1	46.0
2X30T12MB	1	74.0
3X34T12MB2	1	115.0
4X17T8EBN	0	61.0

Following table summarizes average annual burn hours by room types and corresponding coincidence factors used for estimating savings for this ECM:

Room Type / Usage Group	Existing Burn Hours	Proposed Burn Hours	Coincidence Factor
24/7 High Burn Hours	8,760	8,760	100%
Art Gallery	2,600	2,600	N/A
Break room	2,600	2,600	90%
Break room - Sensored Post-retrofit	2,600	1,820	N/A
Cafeteria	2,600	2,600	90%
Cafeteria - Already Sensored	1,820	1,820	90%
Cafeteria - Sensored Post-retrofit	2,600	1,820	90%
Community/ Recreation	2,600	2,600	N/A
Community/ Recreation - Already Sensored	1,820	1,820	N/A
Community/ Recreation - Sensored Post-retrofit	2,600	1,820	N/A
Community/Recreation (Low Hrs)	1,500	1,500	N/A
Community/Recreation (Low Hrs) - Sensored Post-retrofit	1,500	1,050	N/A
Conference Room	2,600	2,600	N/A
Conference Room - Sensored Post-retrofit	2,600	1,820	N/A
Court Room/Trial Areas	2,600	2,600	90%
Elevator	8,760	8,760	100%
Exit Signs	8,760	8,760	100%
Exterior	4,380	4,380	10%
Fire House	2,600	2,600	N/A
Fire House - Already Sensored	1,820	1,820	N/A
Fire House - Sensored Post-retrofit	2,600	1,820	N/A
Golf	2,600	2,600	N/A
Golf - Already Sensored	1,820	1,820	N/A

Schedule 2-4

Room Type / Usage Group	Existing Burn Hours	Proposed Burn Hours	Coincidence Factor
Hallway	2,600	2,600	90%
Hallway - Already Sensored	1,820	1,820	90%
Kitchen	2,600	2,600	N/A
Kitchen - Sensored Post-Retrofit	2,600	1,820	N/A
Living Quarters/Bunk Rooms	500	500	N/A
Lobby/Entry Vestibule	2,600	2,600	N/A
Maritime Center	2,600	2,600	N/A
Maritime Center - Already Sensored	1,820	1,820	N/A
Maritime Center - Sensored Post-retrofit	2,600	1,820	N/A
Mechanical/Electrical Rooms	500	500	90%
Office Support	2,600	2,600	90%
Office Support - Already Sensored	1,820	1,820	90%
Office Support - Sensored Post-retrofit	2,600	1,820	90%
Open Office	2,600	2,600	90%
Open Office - Sensored Post-retrofit	2,600	1,820	90%
Park Facility	1,000	1,000	N/A
Park Facility - Sensored Post-retrofit	1,000	700	N/A
Parks Dept	2,600	2,600	N/A
Parks Dept - Sensored Post-retrofit	2,600	1,820	N/A
Police	2,600	2,600	90%
Police - Sensored Post-retrofit	2,600	1,820	90%
Pool (Interior)	2,600	2,600	N/A
Pool (Interior) - Sensored Post-retrofit	2,600	1,820	N/A
Private Office	2,600	2,600	90%
Private Office - Already Sensored	1,820	1,820	90%
Private Office - Sensored Post-retrofit	2,600	1,820	90%
Public Services	2,600	2,600	N/A
Public Services - Already Sensored	1,820	1,820	N/A
Public Services - Sensored Post-retrofit	2,600	1,820	N/A
Restroom	2,600	2,600	90%
Restroom - Already Sensored	1,820	1,820	90%
Restroom - Sensored Post-retrofit	2,600	1,820	90%
Retail	2,600	2,600	N/A
Slave Mart	2,600	2,600	N/A
Stadium (interior)	500	500	N/A
Stadium (interior)- Already Sensored	350	350	N/A
Stadium (interior) - Sensored Post-retrofit	500	350	N/A
Stairwell	8,760	8,760	100%
Stairwell - Sensored Post-retrofit	8,760	6,132	100%

Room Type / Usage Group	Existing Burn Hours	Proposed Burn Hours	Coincidence Factor
Storage	500	500	90%
Storage - Already Sensored	350	350	N/A
Storage - Sensored Post-retrofit	500	350	N/A
Tennis (interior)	2,600	2,600	N/A
Tennis (interior) - Sensored Post-retrofit	2,600	1,820	N/A
Theater	2,500	2,500	N/A
Theater - Sensored Post-retrofit	2,500	1,750	N/A
Utility/Janitor Closets	500	500	N/A
Visitor Center	2,600	2,600	N/A
Visitor Center - Sensored Post-retrofit	2,600	1,820	N/A
Warehouse	2,600	2,600	N/A

Equations for Calculating Lighting Retrofit Savings

Demand (kW)

$$Connected\ kW\ Saving = \Sigma_u [\ (kW/Fixture_{baseline} \times Quantity_{baseline} - kW/Fixture_{post} \times Quantity_{post})]_{t,u}$$

$$Actual\ kW\ Savings = \Sigma_u [\ Connected\ kW\ Savings_u \times Coincident\ Factor_u]_{t,u}$$

where:

$kW/fixture_{baseline}$ =	lighting baseline demand per fixture for usage group u
$kW/fixture_{post}$ =	lighting demand per fixture during post-installation period for usage group
$Quantity_{baseline}$ =	quantity of affected fixtures before the lighting retrofit for usage group u
$Quantity_{post}$ =	quantity of affected fixtures after the lighting retrofit for usage group u
$Coincident\ Factor_u$ =	*Coincident* Factor is a multiplier to account for Demand Diversity of each specific usage group u.

Examples of usage groups include "hallways" and "offices".

Demand savings apply only to Greenberg Complex facility.

Energy (kWh)

$$kWh\ Savings_{Lighting} = \Sigma_u [Connected\ kW\ Savings_u \times Burn\ Hours]_{t,u}$$

where:

$kW\ Savings_u$ =	kilowatt savings realized during the post-installation time for usage group u
$Burn\ Hours$ =	number of operating hours during the time period t for the usage group u

HVAC Impact

Additional electrical savings will be achieved because the reduced lighting load will in turn reduce cooling loads at the facilities. Heating loads will similarly increase. These impacts were calculated using the Rundquist method as documented in the November 1993 ASHRAE Journal.

Fraction of Lighting Savings as Air Cooling Savings = *Fraction of the Year of the Cooling Season* x *Lighting Load Met by Mechanical Cooling / System's Coefficient of Performance*

NOTE: The HVAC savings only applied to lighting retrofits in the conditioned spaces.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 1	1,528,473 kWh	282 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 1 and 2 (electronic attachment) for the detailed expected savings calculations for ECM-1.

ECM 2 - Parking Garage Lighting Upgrades

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 - 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through a reduction in energy used by the lighting system; therefore, the measurement boundary is the lighting system itself.

Key Parameter	Measurement Frequency	Measurement Description
Pre- and Post-retrofit Fixture Power Draw (kW)	One-time	The measured post-retrofit lighting fixture wattages from the last phase (Phase II) of the Performance Contract were used as pre-retrofit fixture wattages for this phase. Measured wattages were used when possible. In some situations, such as when a certain type of lighting fixture was not available by itself on a switch, typical wattages as published by ANSI (American National Standards Institute) were used. The post-retrofit wattage of the impacted fixtures will be measured one time on a sample of fixtures meeting the same sampling criteria. The savings will be updated.
Burn Hours For lighting other	Short-term	Mutually agreed burn hours by predominant space types from the last phase (Phase II) of the

Key Parameter	Measurement Frequency	Measurement Description
than Parking Garage		Performance Contract were used for this phase. The table below shows the average annual baseline burn hours by space type. These values will not be measured again.

Following table summarizes existing fixture codes and corresponding average power draws.

Existing Fixture Code	Existing Fix Qty.	Average Fixture Wattage
1X74LEDF	2,771	74.0
2X28T8EBN	585	42.0
1X28T8EBN	389	26.0
2X34T12MB	216	72.0
1X150MH	190	181.1
1X100LEDF	116	100.0
1X3LEDEXIT	63	3.0
1X23CFLSI	50	23.0
1X5LEDF	48	5.0
1X175MH	47	215.0
1X40LEDF	46	40.0
4X28T8EBN	38	84.0
1X200LEDF	37	200.0
1X400MH	24	459.9
3X28T8EBN	20	64.0
1X50LEDF	16	50.0
1X250MH	14	295.0
1X100IND	10	108.5
1X10LEDF	9	10.0
1X150HPS	6	186.2
2X17T8EBN	6	33.0
DRINK	5	400.0
2X18CFL2P	4	38.0
2X26CFL4P	4	51.0
1X18CFLSI	3	18.0
1X150INCA	2	150.0
1X32CFL4P	2	35.5
1X10LEDSI	1	10.0
1X40INCA	1	40.0
2X20T12MB	1	50.0
2X9CFLEXIT	1	20.0
4X34T12MB2	1	144.0

Existing Fixture Code	Existing Fix Qty.	Average Fixture Wattage
SNACK	1	180.0

Following table summarizes average annual burn hours by room types and corresponding coincidence factors used for estimating savings for this ECM:

Space Type	Existing Burn Hours	Proposed Burn Hours
Breakroom	2,600	2,600
Elevator	8,760	8,760
Exit Sign	8,760	8,760
Exterior	4,380	4,380
Exterior - 24x7	8,760	8,760
Garage - Sensored Post-retrofit	8,760	6,132
Garage	8,760	8,760
Garage Canopy - Sensored Post-retrofit	8,760	4,818
Garage Rooftop	4,380	4,380
Hallway	2,600	2,600
Hallway	8,760	8,760
Lobby - Sensored Post-retrofit	8,760	6,132
Lobby	8,760	8,760
Office - Sensored Post-retrofit	2,600	1,820
Office	2,600	2,600
Office	8,760	8,760
Restroom	2,600	2,600
Restroom - Sensored Post-retrofit	8,760	4,818
Restroom	8,760	8,760
Stairs - Sensored Post-retrofit	8,760	4,818
Stairs	8,760	8,760
Storage – Low Use	500	500
Storage	8,760	8,760
Ticket Booth	2,600	2,600
Ticket Booth	8,760	8,760
Utility – Low Use	500	500
Utility	8,760	8,760

Equations for Calculating Lighting Retrofit Savings

Energy (kWh)

$$kWh\ Savings_{Lighting} = \Sigma_u\,[Connected\ kW\ Savings_u\ x\ Burn\ Hours]_{t,u}$$

where:

$kW\ Savings_u$ =	kilowatt savings realized during the post-installation time for usage group u
Burn Hours =	number of operating hours during the time period t for the usage group u

Since demand charges do not apply to Parking Garage facilities, demand savings are not accounted for ECM-2.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM-2	1,203,995 kWh	0 kW	0 Therms	0 kGal.

Refer to Exhibit 1 and 2 (electronic attachment) for the detailed expected savings calculations for ECM-2.

ECM 3a - HVAC Building Controls Improvements

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use by effective control of the equipment; therefore, the measurement boundary is the equipment itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperatures and operating schedules	Short-term	The operation of existing HVAC system was verified utilizing short term data logging of environmental conditions and mechanical equipment. Space temperature measurements were performed for sample of the spaces using HOBO temperature loggers from 5/31/2017 through 6/29/2017. Where possible, current transducers (CTs) were installed on the AHU fan motors to record fan runtimes. This information provided fair amount of information about current equipment schedules and operation.

Key Parameter	Measurement Frequency	Measurement Description
Post Installation Occupied/Unoccupied Control	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the new control system to verify that post-retrofit occupied and un-occupied period temperature setpoints and equipment schedules are maintained at the levels required to maintain the savings as listed in Schedule 2; Section IV. Following control points shall be trended and monitored during the Performance Period: Mode of Operation (Heating/Cooling): Trend every 15 minutes Zone Temperature: Trend every 15 minutes Zone Temperature Set Point: Trend every 15 minutes Occupancy Mode: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Heat Pump Efficiency	EER: 11.2 COP: 3.28	The heating and cooling efficiencies for the split system heat pump were based on the nameplate information. Nameplate equipment data and efficiencies were also used as inputs in the eQUEST or Bin model calculation

Refer to Exhibit 1, ECM 3a for the summary of measured average space temperatures during occupied and un-occupied periods and HVAC fan runtimes during the Baseline period in the sampled Park houses.

Since the majority of the Park houses under the scope this ECM are between 1250 – 1500 SF and have more or less similar construction, an eQUEST model was created for a Park house building with 1250 SF gross area. The eQUEST model was primarily used to estimate energy (kWh) savings per unit area (SF). The per unit area energy savings established using the eQUEST model were then used to estimate for each Park house based on the individual gross areas.

The measured baseline average temperatures, as highlighted in the above tables for the respective park houses, were averaged and used as pre-retrofit occupied and un-occupied cooling temperature (73.2°F) in the eQUEST model. Since data logging was performed during the cooling season, pre-retrofit heating occupied and un-occupied period temperature was assume to be 72.0°F. Post-retrofit occupied and un-occupied period temperature setpoints and HVAC equipment schedules, as described in Schedule 2; Section V, were used in the eQUEST model.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 3a	245,089 kWh	0 kW	0 Therms	0 kGal.

Refer to Exhibit 1 (electronic attachment) for the detailed expected savings calculations for ECM-3a.

ECM 3b - HVAC Building Controls Fire Stations

Since the HVAC equipment serving the Fire Stations run 24x7, no savings have been claimed for this ECM. The new HVAC controls system will provide remote monitoring capability.

ECM 4 - R22 Equipment Replacement

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the HVAC equipment; therefore, the measurement boundary is the equipment itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperatures and operating schedules	Short-term	The operation of existing HVAC system was verified utilizing short term data logging of environmental conditions and mechanical equipment. Space temperature measurements were performed for sample of the spaces using HOBO temperature loggers from 5/19/2017 through 7/6/2017. Where possible, current transducers (CTs) were installed on the AHU fan motors to record fan runtimes. This information provided fair amount of information about current equipment schedules and operation.
Post Installation Split System or Packaged unit operation	Continuous	The savings from this ECM will be verified annually via inspection of the sample of the equipment and thermostat settings (temperature setpoints, schedules, fan operation etc.). Any deficiencies observed

Key Parameter	Measurement Frequency	Measurement Description
		during the inspections will be reported in the annual report.
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Pre and Post-retrofit Split system / Heat Pump Efficiency (EERs)	Refer to table in Schedule 1, ECM 4 General Description	The heating and cooling efficiencies for the existing and proposed split system and heat pumps were based on the nameplate information. The heating and cooling efficiencies for the existing HVAC system were degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 4, "Charleston PhIII – Unitary HVAC Savings_Rev12.xlsx" for additional details on the utilized maintenance factors as per the age of the equipment. Nameplate equipment data and efficiencies were used as inputs in the Bin model calculation.

Refer to Exhibit 1, ECM 4 for the summary of measured average space temperatures and HVAC fan runtimes during the Baseline period in the sampled facilities.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 4	208,353kWh	0 kW	29 Therms	0 kGal.

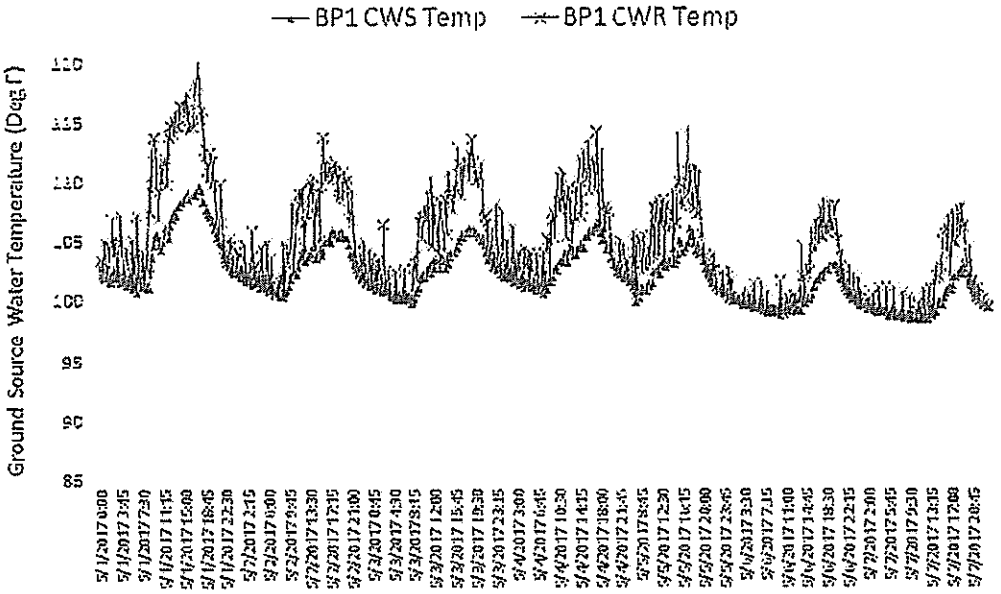
Refer to Exhibit 1, ECM 4 (electronic attachment) for the detailed expected savings calculations for ECM-4.

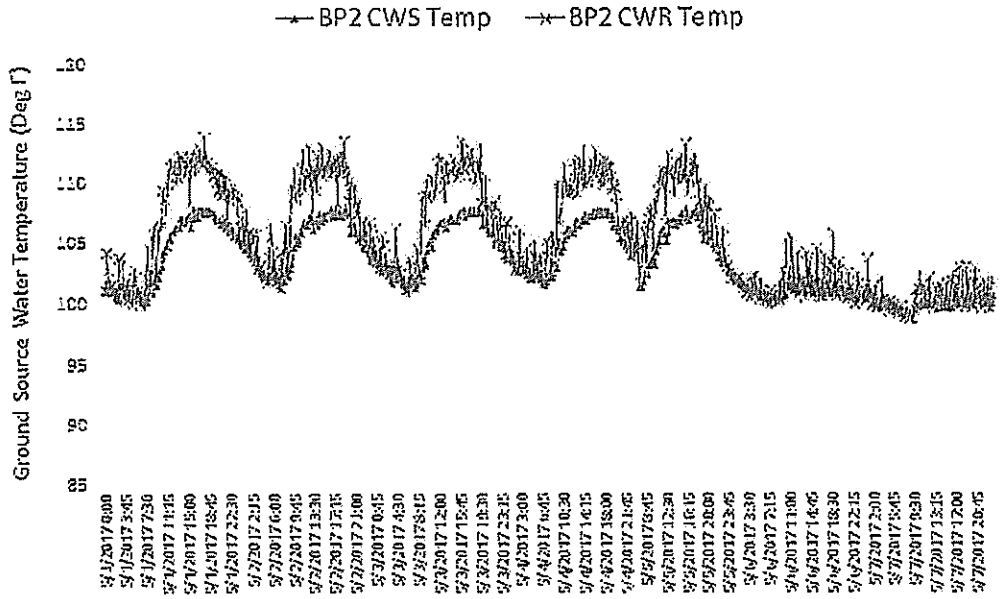
ECM 5a - Ground Loop Improvements - City Hall

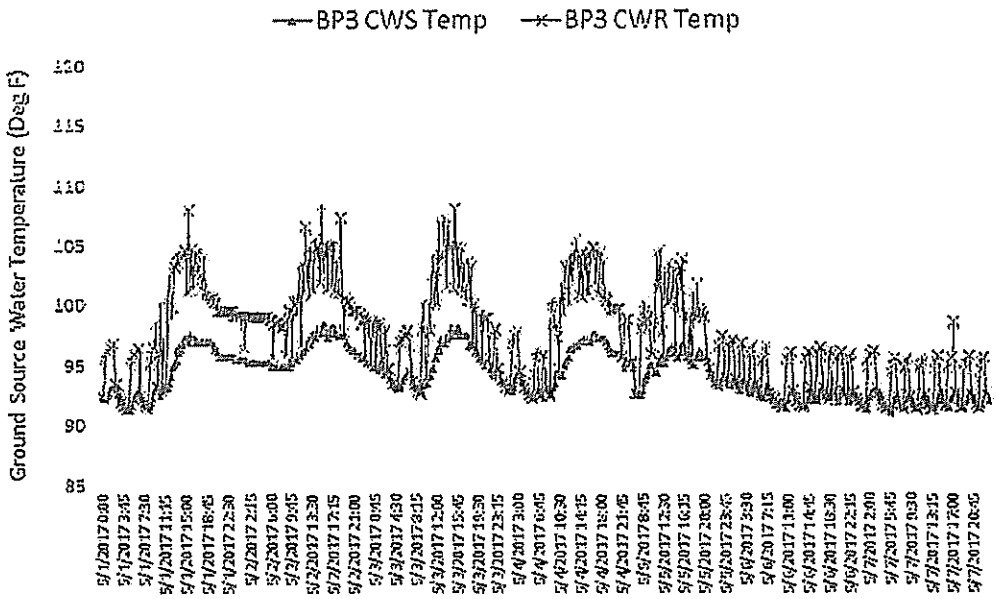
The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the ground source heat pumps; therefore, the measurement boundary is the ground source heat pump system itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline ground loop supply and return temperatures	Short-term	The operation of existing ground loop system was verified by analyzing available trend data from the existing BMS. 15-min interval trend data for the supply and return ground loop temperatures from 5/1/2017 through 5/7/2017 was utilized for the analysis.
Post Installation ground loop supply and return temperatures	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the existing BMS to verify that post-retrofit ground loop supply temperatures are maintained at the levels (85-90°F) required to maintain the savings associated with this ECM. Following control points shall be trended and monitored during the Performance Period: For loops BP-1, 2 & 3: Loop water Supply Temperature: Trend every 15 minutes Loop water Return Temperature: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Ground Source Heat Pump Efficiency (EER)	Ground Source Heat Pumps Pre: 7.7 Post: 10.8 Ground Source Heat Pump Chiller Pre: 10.7 Post: 16	The pre and post-retrofit efficiencies for the ground source heat pumps & chiller were based on the nameplate information. The efficiencies were degraded based on the elevated condenser/loop water temperatures. The efficiencies for the ground source heat pumps were also degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 5b, "0_City of Charleston City Hall – eQUEST Savings Analysis.xlsx" for additional details on the utilized maintenance factors as per the age of the equipment. Nameplate equipment data and efficiencies were used as inputs in the eQUEST model.

The following charts show supply and return ground loop temperatures observed during the Baseline period. As per the design 85°F condenser water supply temperature is specified for the ground source heat pumps serving the City Hall, it is obvious that for loops BP1 and BP2, supply water temperatures consistently remain 10-20°F higher than the design. This results in drastically reduced efficiencies for the ground source heat pumps.







The installation of new liquid coolers to augment existing ground water loops is expected to reduce loop water temperatures; thereby improving the efficiency of existing water source heat pumps.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 5a	41,403 kWh	0 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 5a (electronic attachment) for the detailed expected savings calculations for ECM-5a.

ECM 5b - Control Improvements - City Hall

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use effective control of the HVAC system; therefore, the measurement boundary is the HVAC system itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperatures and operating	Short-term	The operation of existing HVAC system was verified by analyzing available trend data

Key Parameter	Measurement Frequency	Measurement Description
schedules		from the existing BMS. 15-min interval trend data from 5/8/2017 through 5/23/2017 for various parameters including space temperature, discharge air temperature, supply fan command-status, compressor command-status etc. were used for the analysis.
Post Installation Occupied/Unoccupied Control	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the exist BMS to verify that post-retrofit occupied and un-occupied period temperature setpoints and equipment schedules are maintained at the levels required to achieve the savings associated with this ECM.. Following control points shall be trended and monitored during the Performance Period: Mode of Operation (Heating/Cooling): Trend every 15 minutes Zone Temperature: Trend every 15 minutes Zone Temperature Set Point: Trend every 15 minutes Occupancy Mode: Trend every 15 minutes Supply Fan Command-Status: Trend every 15 minutes Fresh Air Damper Position: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Ground Source Heat Pump Efficiency (EER)	Pre: 7.7 Post: 10.8	The pre and post efficiencies for the ground source heat pumps were based on the nameplate information. The efficiencies were degraded based on the elevated condenser/loop water temperatures. The efficiencies for the ground source heat pumps were also degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 5b, "0_City of Charleston City Hall – eQUEST Savings Analysis.xlsx" for additional details on the utilized maintenance factors as per the age of the

Key Parameter	Measurement Frequency	Measurement Description
		equipment. Nameplate equipment data and efficiencies were used as inputs in the eQUEST model.

Refer to Exhibit 1, ECM 5b for the summary of measured average space temperatures during occupied and un-occupied periods during the Baseline period at the City Hall.

Refer to Schedule 2; Section IV for post-retrofit occupied and un-occupied temperature setpoints.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 5b	151,191 kWh	0 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 5a (electronic attachment) for the detailed expected savings calculations for ECM-5b.

ECM 6a -VRF HVAC System Upgrades - Joe Riley Ballpark

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the HVAC equipment; therefore, the measurement boundary is the HVAC equipment itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperatures and operating schedules	Short-term	The operation of existing HVAC system was verified by analyzing available trend data from the existing BMS. 15-min interval trend data from 5/25/2017 through 6/1/2017 for various parameters including space temperature, discharge air temperature, supply fan command-status, compressor command-status etc. were used for the analysis.
Post Installation VRF system operating	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the existing

Key Parameter	Measurement Frequency	Measurement Description
parameters		BMS to verify that post-retrofit occupied and un-occupied period temperature setpoints and equipment schedules are maintained at the levels required to maintain the savings as listed in Schedule 2; Section IV. Following control points shall be trended and monitored during the Performance Period: Mode of Operation (Heating/Cooling): Trend every 15 minutes Zone Temperature: Trend every 15 minutes Zone Temperature Set Point: Trend every 15 minutes Occupancy Mode: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Existing Split/Packaged System & VRF System Efficiency (EERs)	Refer to table in Schedule 1, ECM 6a General Description	The pre and post heating and cooling efficiencies for the existing split systems or packaged heat pumps were based on the nameplate information. The heating and cooling efficiencies for the existing equipment were degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 4, "Charleston PhIII – Unitary HVAC Savings_Rev12.xlsx" for additional details on the utilized maintenance factors as per the age of the equipment. Nameplate equipment data and efficiencies were used as inputs in the Bin model calculation.

Refer to Exhibit 1, ECM 6a for the summary of measured average space temperatures in sample of spaces during the Baseline period at the Joe Riley Ballpark facility.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM	Measured

ID	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 6a	299,466 kWh	0 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 4 (electronic attachment) for the detailed expected savings calculations for ECM-6a.

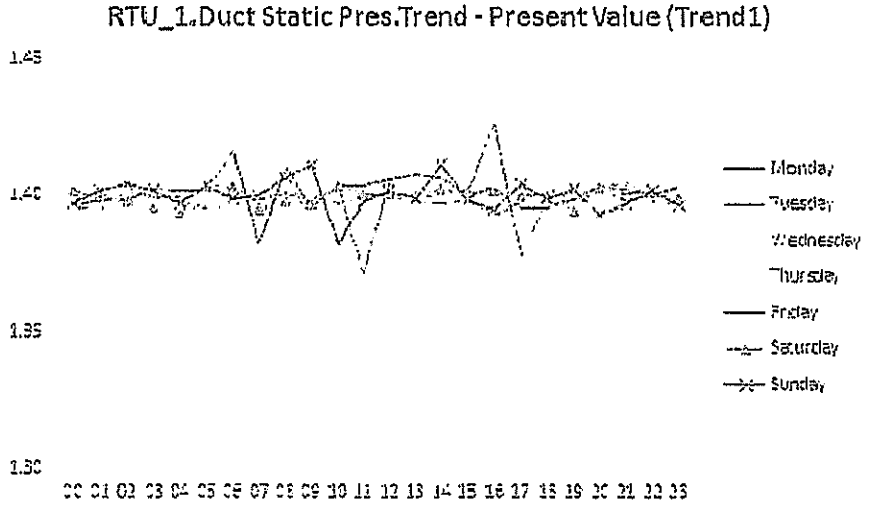
ECM 7a - HVAC Controls Improvements - Greenberg Municipal Complex

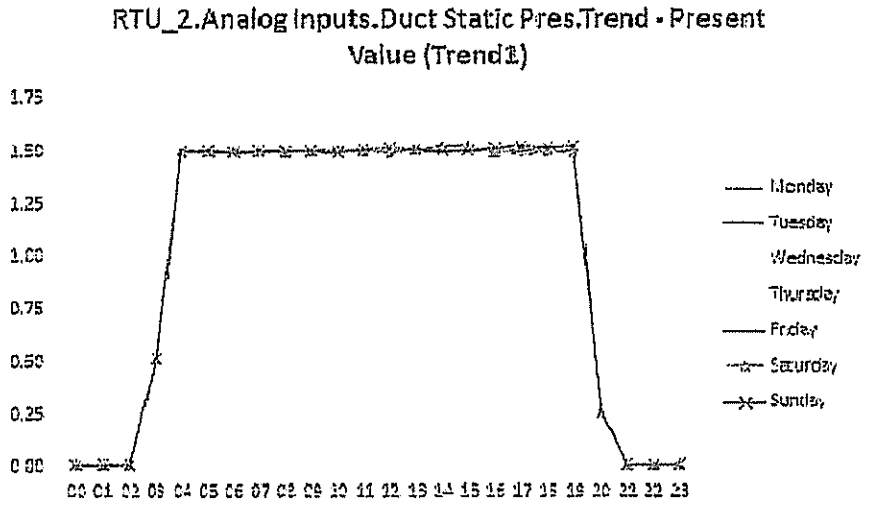
The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use effective control of the HVAC system; therefore, the measurement boundary is the HVAC system itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperatures, discharge air temperatures, VFD command, duct static pressures and operating schedules	Short-term	The operation of existing HVAC system was verified by analyzing available trend data from the existing BMS. 15-min interval trend data from 5/15/2017 through 5/22/2017 for various parameters including space temperature, discharge air temperature, supply fan command-status, duct static pressure, VFD commands etc. were used for the analysis.
Post Installation space temperatures, discharge air temperatures, VAV CFMs, duct static pressures, CO_2 levels and operating schedules	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the existing BAS to verify that post-retrofit occupied and un-occupied period temperatures, VAV CFMs, duct static pressures, CO_2 levels, and equipment schedules are maintained at the levels required to achieve the savings associated with this ECM. Following control points shall be trended and monitored during the Performance Period: Mode of Operation (Heating/Cooling): Trend every 15 minutes Zone Temperature: Trend every 15 minutes Zone Temperature Set Point: Trend every 15 minutes Occupancy Mode: Trend every 15 minutes Supply Fan Command-Status: Trend every 15

Key Parameter	Measurement Frequency	Measurement Description
		minutes Duct Static Pressure: Trend every 15 minutes CO_2 Levels: Trend every 15 minutes VAV CFMs: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Rooftop Unit Efficiencies (EER)	RTU-1 Pre: 7.4 Post: 10.2 RTU-2 Pre: 7.4 Post: 10.4 RTU-3&4 Pre: 8.5 Post: 12.2	The pre and post-retrofit equipment heating and cooling efficiencies for the rooftop units were based on the nameplate information. The heating and cooling efficiencies for the existing RTUs were degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 7a, "0_City of Charleston Greenberg Complex - eQUEST Savings Analysis.xlsx" for additional details on the utilized maintenance factors as per the age of the equipment. Nameplate equipment data and efficiencies were used as inputs in the eQUEST model.

The following charts show measured average static pressures during occupied and un-occupied periods for the Baseline period at the Greenberg Complex. It is obvious from the charts that duct static pressure reset schedule does not exist on RTU-1 & 2 which could effectively ramp supply fan up and down based on the cooling and heating demands.

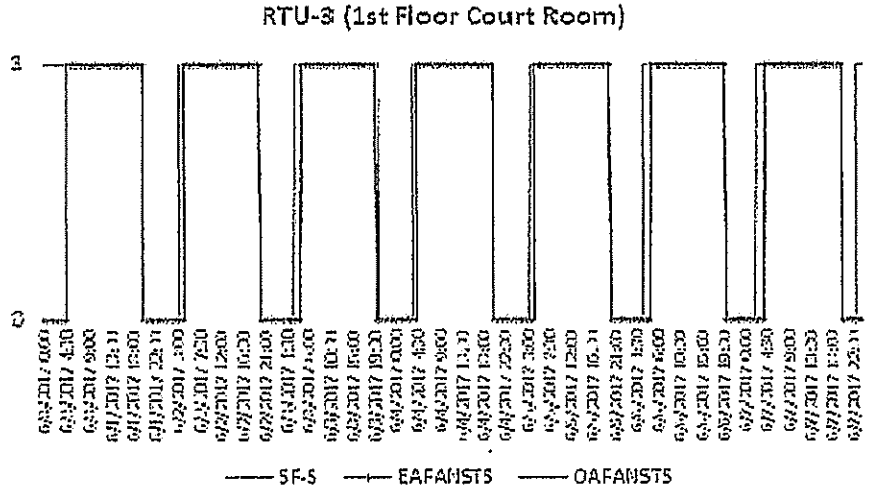


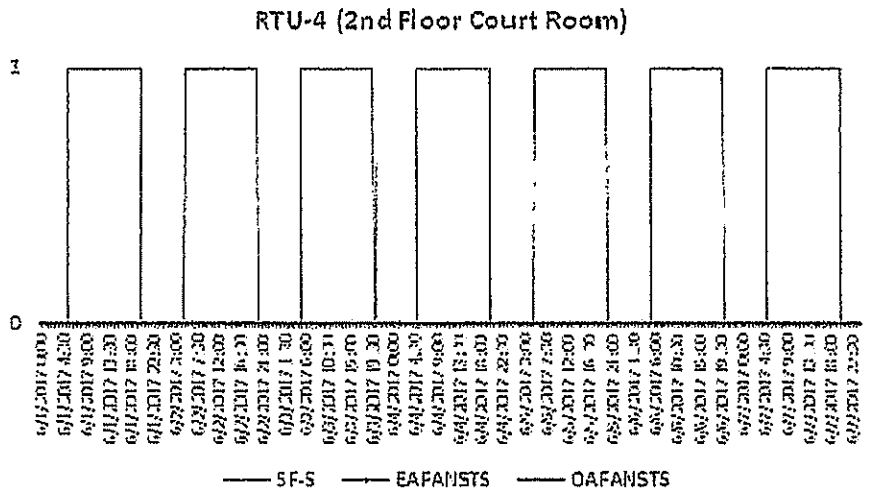


The following charts show RTU supply, ERV Exhaust & Fresh air fan statuses during the Baseline period at the Greenberg Complex. It is obvious from the RTU-3 chart that ERV unit runs all the time when RTU supply fan is running from 4:30am to 8:00pm. The ERV units on the RTUs could remain off when the court rooms are unoccupied.

The ERV on RTU-4 was turned off due to ongoing repairs at the time of analysis.

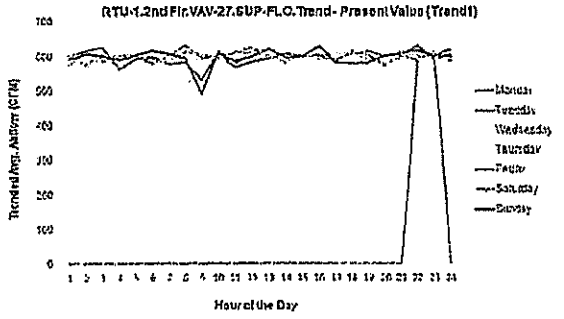
The amount of fresh air brought into court rooms will be controlled effectively post-retrofit by installing occupancy sensors in the court rooms. The ERVs will run only during the occupied period as sensed by the new occupancy sensors, thereby reducing fresh air load for considerable period of time.

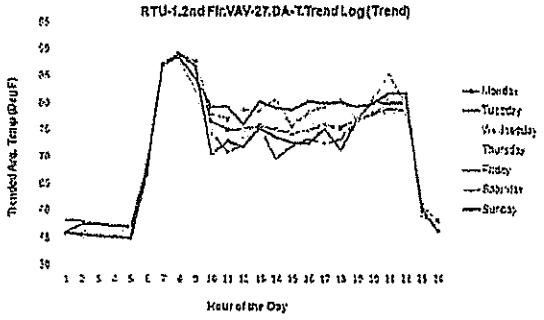


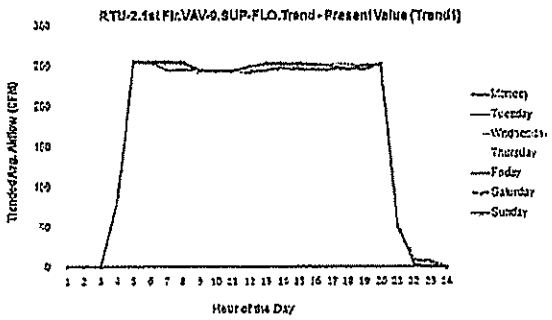


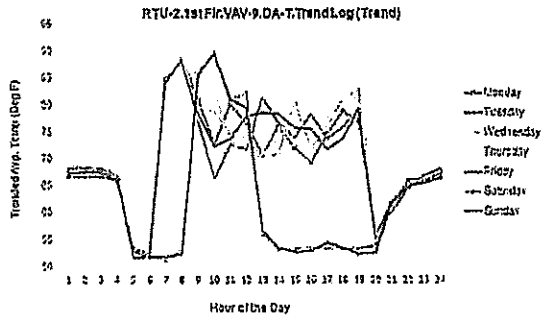
The following charts show VAV box CFMs and discharge air temperatures recorded during the Baseline period at the Greenberg Complex. The graphs on the right hand side for discharge air temperatures clearly show considerable electric reheat operation throughout the day even during the peak cooling season. The charts on the left show that VAV box CFMs do not exceed respective minimum CFM setpoints. Similar pattern was observed for majority of the VAV boxes serving the Greenberg complex.

It is obvious from the analysis that either VAV boxes are oversized or minimum setpoints are set higher than required for the space loads. The VAV box recommissioning recommended under the scope of this ECM will reevaluate current space loads and properly adjust VAV box cooling minimum, cooling maximum and heat CFMs. As a result excessive use of reheat is expected to be eliminated during the peak cooling season.









Refer to Schedule 2; Section IV for post-retrofit occupied and un-occupied temperature setpoints.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 7a	9,187 kWh	85 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM-7a (electronic attachment) for the detailed expected savings calculations for ECM-7a.

ECM 7b - HVAC Equipment Replacement - Greenberg Municipal Complex

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the HVAC equipment; therefore, the measurement boundary is the equipment itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperatures and operating schedules	Short-term	The operation of existing HVAC system was verified by analyzing available trend data from the existing BMS. 15-min interval trend data from 5/15/2017 through 5/22/2017 for various parameters including space temperature, discharge air temperature, supply fan command-status, duct static pressure, VFD commands etc. were used for the analysis.
Post Installation RTU operating parameters	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the existing BMS to verify that post-retrofit occupied and

Key Parameter	Measurement Frequency	Measurement Description
		un-occupied period temperature setpoints and equipment schedules are maintained at the levels required to maintain the savings as listed in Schedule 2; Section IV. Following control points shall be trended and monitored during the Performance Period: Mode of Operation (Heating/Cooling): Trend every 15 minutes Zone Temperature: Trend every 15 minutes Zone Temperature Set Point: Trend every 15 minutes Occupancy Mode: Trend every 15 minutes Supply Fan Command-Status: Trend every 15 minutes Supply Fan Speeds: Trend every 15 minutes Duct Static Pressure: Trend every 15 minutes VAV CFMs: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Split system / Heat Pump Efficiency (EER)	RTU-1 Pre: 7.4 Post: 10.2 RTU-2 Pre: 7.4 Post: 10.4 RTU-3&4 Pre: 8.5 Post: 12.2	The heating and cooling efficiencies for the rooftop units were based on the nameplate information. The heating and cooling efficiencies for the existing RTUs were degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 7a, "0_City of Charleston Greenberg Complex - eQUEST Savings Analysis.xlsx" for additional details on the utilized maintenance factors as per the age of the equipment. Nameplate equipment data and efficiencies were used as inputs in the eQUEST model.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water

ECM 7b	43,449 kWh	278 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 7a (electronic attachment) for the detailed expected savings calculations for ECM-7b.

ECM 8a - Dual Duct Box Replacement - POLICE STATION

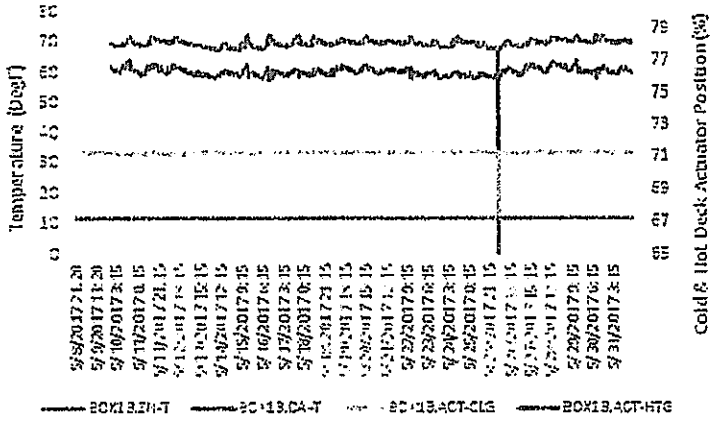
The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the Dual Duct system; therefore, the measurement boundary is the Dual Duct system itself.

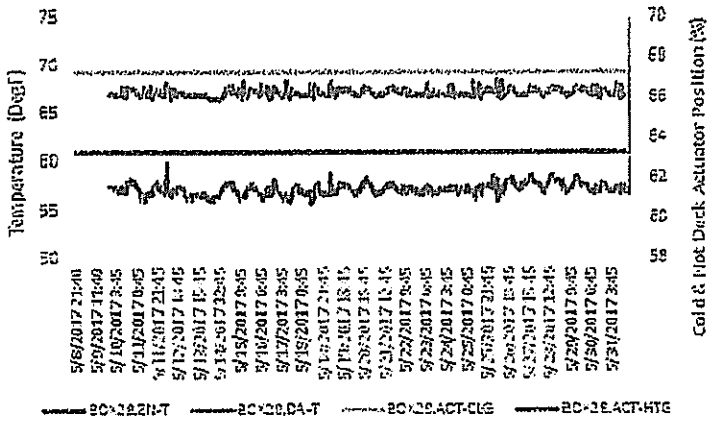
Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperatures and operating schedules	Short-term	The operation of existing Dual Duct HVAC system was verified by analyzing available trend data from the existing BMS. 15-min interval trend data from 5/8/2017 through 5/31/2017 for various parameters including space temperature, discharge air temperature, dual duct box hot and cold deck damper actuator positions etc. were used for the analysis. Nameplate dual duct box schedule, equipment data and efficiencies collected during the site visits were also used as inputs in the eQUEST model.
Post Installation Dual Duct system operating parameters	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the existing BMS to verify that post-retrofit occupied and un-occupied period temperature setpoints and equipment schedules are maintained at the levels required to maintain the savings as listed in Schedule 2; Section IV. Following control points shall be trended and monitored during the Performance Period: Mode of Operation (Heating/Cooling): Trend every 15 minutes Zone Temperature: Trend every 15 minutes Zone Temperature Set Point: Trend every 15 minutes Occupancy Mode: Trend every 15 minutes

Key Parameter	Measurement Frequency	Measurement Description
		Supply Fan Command-Status: Trend every 15 minutes Supply Fan Speeds: Trend every 15 minutes Duct Static Pressure: Trend every 15 minutes VAV CFMs: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Air-Cooled Chiller Efficiency (kW/ton)	0.7	The efficiency for the existing air-cooled chiller was based on the measurements. Refer to Exhibit 1, ECM 8a, "0 Charleston - Chiller M+V Hourly Summary_rev1.xlsx" for additional details on the chiller efficiency measurements.

The following charts show dual duct box discharge air and zone temperatures along with respective hot and cold deck damper positions recorded during the Baseline period serving the Police Station. It is obvious from the charts that the box discharge and zone temperatures are maintained at same setpoints irrespective of time of day or occupancy. The hot and cold deck damper positions do not appear to change based on the space temperatures, making the system work as a constant volume system. Similar pattern was observed for majority of the existing dual duct boxes serving the Police Station.

Post-retrofit, hot and cold deck dampers in the new VAV boxes are expected to effectively modulate in response to space load conditions as a true pressure independent system. The discharge and space temperatures associated with the new dual duct boxes will also respond to space occupancy as sensed by the occupancy sensors integral to the new thermostats.





The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 8a	156,481 kWh	178 kW	424 Therms	0 kGal.

Refer to Exhibit 1, ECM 7a (electronic attachment) for the detailed expected savings calculations for ECM-8a.

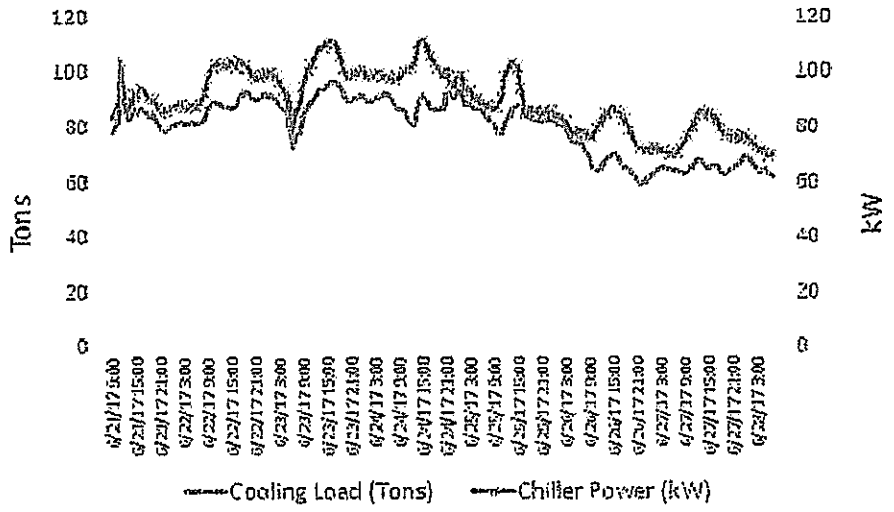
ECM 8b - Chiller Replacement - POLICE STATION

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the chiller; therefore, the measurement boundary is the chiller itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline Btu Delivered & Chiller Power	Short-term	The existing chilled water load and chiller power were measured for a period of one weeks from 6/21/2017 to 6/28/2017. The average kW/ton of 1.13 measured during the measurement period was used as an input into the eQUEST model. Based on the simulation, the annual chilled water load is 3,059,649,583 Btu. It is agreed that the minimum annual chilled water usage will never be less than this simulated value of 3,059,649,583 Btu.

Key Parameter	Measurement Frequency	Measurement Description
		The baseline annual chilled water Btu is converted to ton-hours using the following conversion: $$Ton - Hours_{base} = \frac{Btu_{base}}{12000 \frac{Btu}{ton - Hours}}$$
Post-installation Btu Delivered	Continuous	The post-installation Btu delivered will be totalized, and the totalized value will be recorded on an hourly basis.
Post-installation kWh	Continuous	The post-installation kWh consumed will be totalized, and the totalized value will be recorded on an hourly basis.
Post-installation Chiller Efficiency	Calculated Based on Measurements	The post-installation chiller efficiency will calculated based on the measured Btu delivered and kWh consumed. The kWh used by the chiller and the Btu delivered will be totalized, and the totalized value will be recorded on an hourly basis. At least quarterly, these data will be reviewed by Johnson Controls. The average annual kW/ton will then be determined by: $$\frac{kW}{ton_{post}} = \frac{annual\ kWh}{\left(\frac{annual\ Btu}{12000 \frac{Btu}{ton - Hour}}\right)}$$

The following chart shows measured cooling load and chiller kW during the measurement period at the Police Station building.



The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 8b	85,589 kWh	222 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 7a (electronic attachment) for the detailed expected savings calculations for ECM-8b.

ECM 8c - AHU2 System Improvement - POLICE STATION

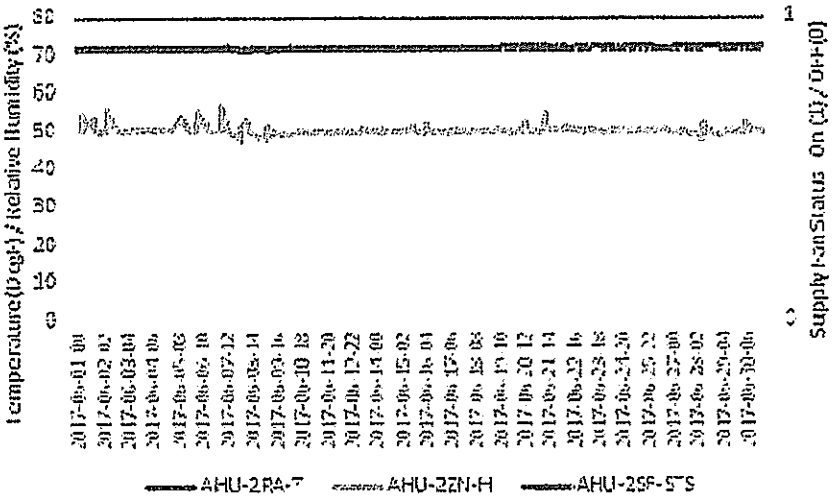
The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to variable air volume conversion of AHU-2; therefore, the measurement boundary is AHU-2 itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline space temperature and operating schedule	Short-term	The operation of existing constant volume AHU-2 was verified by analyzing available trend data from the existing BMS. 15-min interval trend data from 6/1//2017 through 6/30/2017 for various parameters including return air temperature, return air relative humidity, supply fan status etc. was used for

Key Parameter	Measurement Frequency	Measurement Description
		the analysis. Nameplate equipment data and efficiencies collected during the site visits were also used as inputs in the eQUEST model.
Post Installation AHU-2 operating parameters	Continuous	The savings from this ECM will be verified by utilizing the capabilities of the existing BMS to verify that post-retrofit occupied and un-occupied period temperature setpoints and equipment schedules are maintained at the levels required to maintain the savings associated with this ECM. Following control points shall be trended and monitored during the Performance Period: Mode of Operation (Heating/Cooling): Trend every 15 minutes Zone Temperature: Trend every 15 minutes Zone Temperature Set Point: Trend every 15 minutes Occupancy Mode: Trend every 15 minutes Supply Fan Command-Status: Trend every 15 minutes Supply Fan Speed: Trend every 15 minutes Duct Static Pressure: Trend every 15 minutes
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Air-Cooled Chiller Efficiency (kW/ton)	Air-Cooled Chiller Pre: 1.13 Post: 0.7	The efficiency for the existing air-cooled chiller was based on the measurements. The efficiency for the new (post) air-cooled chiller was based on the nameplate information.

The following chart shows return air temperature and zone relative humidity along with the supply fan status for AHU-2 recorded during the Baseline period serving the Evidence Locker. It is obvious from the chart that AHU-2 runs 24x7, 365-days a year maintaining zone temperatures at same setpoints irrespective of time of day or occupancy.

The AHU-2 supply fan is expected to modulate in response to space load conditions as a true variable air volume system.



The annual kWh savings will be calculated according to:

$$kWh_{savings} = Ton - Hours(kW/ton_{pre} - kW/ton_{post})$$

Where Ton-Tours is the higher of the annual measured Ton-Hours or the baseline extrapolated Ton-Hours.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 8c	26,370 kWh	43 kW	374 Therms	0 kGal.

Refer to Exhibit 1, ECM 7a (electronic attachment) for the detailed expected savings calculations for ECM-8c.

ECM 9 - Chiller Replacement - DOCK STREET THEATER

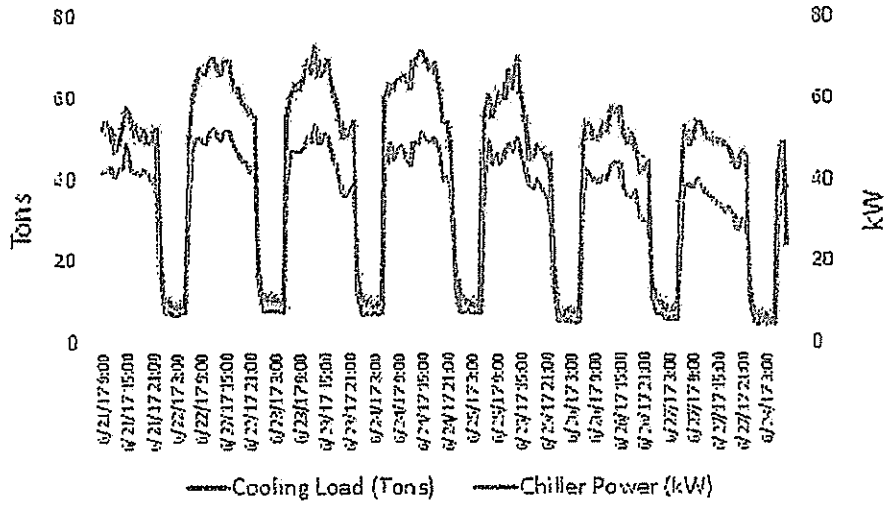
The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the chiller; therefore, the measurement boundary is the chiller itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline Btu Delivered & Chiller Power	Short-term	The existing chilled water load and chiller power were measured for a period of one weeks from 6/21/2017 to 6/28/2017. A Bin model calculation

Key Parameter	Measurement Frequency	Measurement Description
		was calibrated using the data gathered during the measurements period. Based on the Bin model calculation, the annual chilled water load is 2,786,903,658 Btu. It is agreed that the minimum annual chilled water usage will never be less than this simulated value of 2,786,903,658 Btu. The baseline annual chilled water Btu is converted to ton-hours using the following conversion: $$Ton - Hours_{base} = \frac{Btu_{base}}{12000 \frac{Btu}{ton - Hours}}$$
Post-installation Btu Delivered	Continuous	The post-installation Btu delivered will be totalized, and the totalized value will be recorded on an hourly basis.
Post-installation kWh	Continuous	The post-installation kWh consumed will be totalized, and the totalized value will be recorded on an hourly basis.
Post-installation Chiller Efficiency	Calculated Based on Measurements	The post-installation chiller efficiency will calculated based on the measured Btu delivered and kWh consumed. The kWh used by the chiller and the Btu delivered will be totalized, and the totalized value will be recorded on an hourly basis. At least quarterly, these data will be reviewed by Johnson Controls. The average annual kW/ton will then be determined by: $$\frac{kW}{ton_{post}} = \frac{annual\ kWh}{\left(\frac{annual\ Btu}{12000 \frac{Btu}{ton - Hour}}\right)}$$
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Air-Cooled Chiller Efficiency (kW/ton)	Air-Cooled Chiller Pre: 1.21	Based on the measurements, the chiller was observed to be over-cycling during the afterhours due to low load conditions at the facility. This resulted into abnormally high kW/ton measured during those hours.

Key Parameter	Measurement Frequency	Measurement Description
		Hence the efficiency for the existing air-cooled chiller was based on the nameplate information. The cooling efficiency for the existing chiller was degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 4, "Charleston PhIII – Unitary HVAC Savings_Rev12.xlsx" for additional details on the utilized maintenance factors as per the age of the equipment.

The following chart shows measured cooling load and chiller kW during the measurement period at the Dock Street Theatre facility.



The annual kWh savings will be calculated according to:

$$kWh_{Savings} = Ton - Hours(kW/ton_{pre} - kW/ton_{post})$$

Where Ton-Tours is the higher of the annual measured Ton-Hours or the baseline extrapolated Ton-Hours.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water

ECM 9	102,885 kWh	0 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 4 (electronic attachment) for the detailed expected savings calculations for ECM-9.

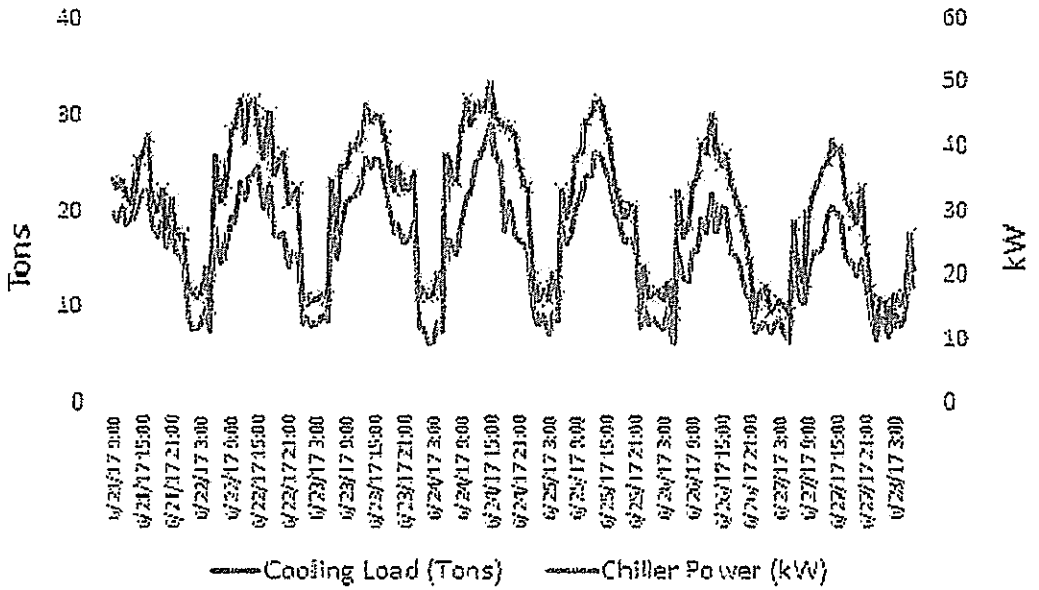
ECM 10 - Chiller Replacement - VRTC - DEAN BUILDING

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in energy use due to improved efficiency of the chiller; therefore, the measurement boundary is the chiller itself.

Key Parameter	Measurement Frequency	Measurement Description
Baseline Btu Delivered & Chiller Power	Short-term	The existing chilled water load and chiller power were measured for a period of one weeks from 6/21/2017 to 6/28/2017. A Bin model calculation was calibrated using the data gathered during the measurements period. Based on the Bin model calculation, the annual chilled water load is 1,382,155,047 Btu. It is agreed that the minimum annual chilled water usage will never be less than this simulated value of 1,382,155,047 Btu. The baseline annual chilled water Btu is converted to ton-hours using the following conversion: $$Ton - Hours_{base} = \frac{Btu_{base}}{12000 \frac{Btu}{ton - Hours}}$$
Post-installation Btu Delivered	Continuous	The post-installation Btu delivered will be totalized, and the totalized value will be recorded on an hourly basis.
Post-installation kWh	Continuous	The post-installation kWh consumed will be totalized, and the totalized value will be recorded on an hourly basis.
Post-installation Chiller Efficiency	Calculated Based on Measurements	The post-installation chiller efficiency will calculated based on the measured Btu delivered and kWh consumed. The kWh used by the chiller and the Btu delivered will be totalized, and the totalized value will be recorded on an hourly basis. At least quarterly, these data will be reviewed by

Key Parameter	Measurement Frequency	Measurement Description
		Johnson Controls. The average annual kW/ton will then be determined by: $\frac{kW}{ton_{post}} = \frac{annual\ kWh}{\left(\frac{annual\ Btu}{12000\ \frac{Btu}{ton - Hour}}\right)}$
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Air-Cooled Chiller Efficiency (kW/ton)	Air-Cooled Chiller Pre: 1.16	Based on the measurements, the chiller was observed to be over-cycling during the afterhours due to low load conditions at the facility. This resulted into abnormally high kW/ton measured during those hours. Hence the efficiency for the existing air-cooled chiller was based on the nameplate information. The cooling efficiency for the existing chiller was degraded based on the age of equipment as per National Renewable Energy Laboratory (NREL) guidelines. Refer to Exhibit 1, ECM 4, "Charleston PhIII – Unitary HVAC Savings_Rev12.xlsx" for additional details on the utilized maintenance factors as per the age of the equipment.

The following chart shows measured cooling load and chiller kW during the measurement period at the VRTC - Dean building.



The annual kWh savings will be calculated according to:

$$kWh_{Savings} = Ton - Hours(kW/ton_{pre} - kW/ton_{post})$$

Where Ton-Tours is the higher of the annual measured Ton-Hours or the baseline extrapolated Ton-Hours.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 10	45,449 kWh	0 kW	0 Therms	0 kGal.

Refer to Exhibit 1, ECM 4 (electronic attachment) for the detailed expected savings calculations for ECM-10.

ECM 11a - Pool Enclosure and Upgrade - MLK POOL

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option C, Whole Facility, since total facility energy cost is the focus. Option C has been specifically selected due to combination of ECMs involved at the facility between the current and previous phases.

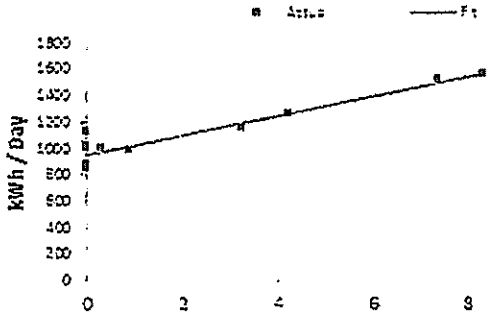
Key Parameter	Measurement Frequency	Measurement Description

Key Parameter	Measurement Frequency	Measurement Description
Baseline Electric and Natural Gas Utility Invoices	Short-term	Utility invoices were collected for the baseline period (January 2016 – December 2016) and a regression analysis was conducted for each meter to determine any correlation between weather conditions and total usage. This analysis was conducted in the "Metrix" utility accounting software. Baseline utility regressions shown below. The above-mentioned base period is post installation of work completed under Amendments I, II & III. Therefore the savings from those Phases stand alone.
Performance Period Electric and Natural Gas Utility Invoices	Continuous	Electric and Natural Gas invoices will be collected on a monthly basis. "Metrix" utility accounting software will be utilized to make comparisons between baseline usage and conditions and current usage and conditions.

Meter Tuning Contract

Project: City of Charleston 3
Area: Martin Pk Pool
Account: 0-1975-0107-0930

Site: City of Charleston 3
Meter: Martin Pk Pool E-0930
Unit: kWh(Qty OnPk)



From	To	# Days	Reading	Incl?	HDD	CDD	Offset	Baseline	Deviation
12/17/15	01/19/16	34	41,760	☒	326.5	0.0	2,033	41,760	0.0%
01/20/16	02/16/16	28	35,360	☒	421.0	0.0	(2,767)	35,360	0.0%
02/17/16	03/17/16	30	35,600	☒	158.5	0.0	5,157	35,600	0.0%
03/18/16	04/18/16	32	26,880	☒	75.5	0.0	(2,265)	26,880	0.0%
04/19/16	05/17/16	29	25,360	☒	1.5	9.0	667	25,360	0.0%
05/18/16	06/17/16	31	31,760	☒	0.0	101.5	(1,325)	31,760	0.0%
06/18/16	07/18/16	31	43,120	☒	0.0	228.5	709	43,120	0.0%
07/19/16	08/17/16	30	42,880	☒	0.0	250.0	(283)	42,880	0.0%
08/18/16	09/19/16	33	37,760	☒	0.0	139.0	267	37,760	0.0%
09/20/16	10/18/16	29	24,960	☒	0.0	25.5	(891)	24,960	0.0%
10/19/16	11/15/16	28	23,120	☒	85.0	0.0	(3,055)	23,120	0.0%
11/16/16	12/15/16	30	34,560	☒	225.0	0.0	1,751	34,560	0.0%
Sum/Average/Max		**365**	**403,120**		**1293.0**	**753.5**	**(0)**	**403,120**	**0% +/- 6.9%**

Martin Pk Pool E-0930 (Account # 0-1975-0107-0930): Tuning Period is 365 days from 12/17/2015 until 12/15/2016.

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (kWh) = 826.8406 x #Days + 36.6713 x HDD + 73.43 x CDD + Offset

The Baseline Equation has a Net Mean Bias of 0% and a Monthly Mean Error of +/-6.9268%. The underlying regression has a R^2=0.867

Baseline Costs are calculated using Average Total Cost/Consumption.

Explanations and Assumptions:

☐ (empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

HDD = Heating Degree-Days calculated for CHARLESTONSC for a 63.0 F° balance point.

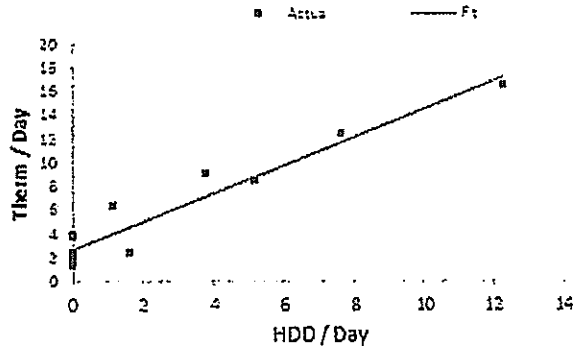
CDD = Cooling Degree-Days calculated for CHARLESTONSC for a 77.0 F° balance point.

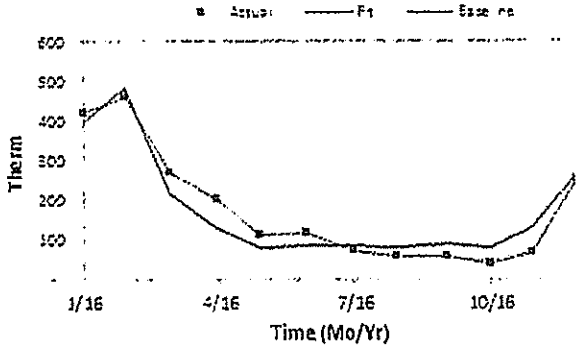
Multiplier and Offset are derived from Modification(s) in effect during the tuning period and are replicated annually for all future periods.

Meter Tuning Contract

Project: City of Charleston 3
Area: Martin Pk Pool
Account: 0-1975-0107-1101

Site: City of Charleston 3
Meter: Mark Pk Pool NG-1101
Unit: Therm(Qty OnPk)





From	To	# Days	Reading	Incl?	HDD	CDD	Offset	Baseline	Deviation
12/17/15	01/19/16	34	422	☒	259.5	0.0	23	422	0.0%
01/20/16	02/16/16	28	462	☒	344.0	0.0	(20)	462	0.0%
02/17/16	03/17/16	30	269	☒	113.5	0.0	53	269	0.0%
03/18/16	04/18/16	32	202	☒	36.5	0.0	71	202	0.0%
04/19/16	05/17/16	29	112	☒	0.0	0.0	32	112	0.0%
05/18/16	06/17/16	31	116	☒	0.0	0.0	31	116	0.0%
06/18/16	07/18/16	31	74	☒	0.0	0.0	(11)	74	0.0%
07/19/16	08/17/16	30	57	☒	0.0	0.0	(25)	57	0.0%
08/18/16	09/19/16	33	58	☒	0.0	0.0	(33)	58	0.0%
09/20/16	10/18/16	29	38	☒	0.0	0.0	(42)	38	0.0%
10/19/16	11/15/16	28	68	☒	46.0	0.0	(63)	68	0.0%
11/16/16	12/15/16	30	251	☒	156.5	0.0	(16)	251	0.0%
Sum/Average/Max		365	2,129		956.0	0.0	(0)	2,129	0% +/- 23.2%

Mark Pk Pool NG-1101 (Account # 0-1975-0107-1101): Tuning Period is 365 days from 12/17/2015 until 12/15/2016.

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (Therm) = 2.7471 x #Days + 1.1781 x HDD + Offset

The Baseline Equation has a Net Mean Bias of 0% and a Monthly Mean Error of +/-23.1663%. The underlying regression has a R^2=0.9205

Baseline Costs are calculated using Average Total Cost/Consumption.

Explanations and Assumptions:

☐ (empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

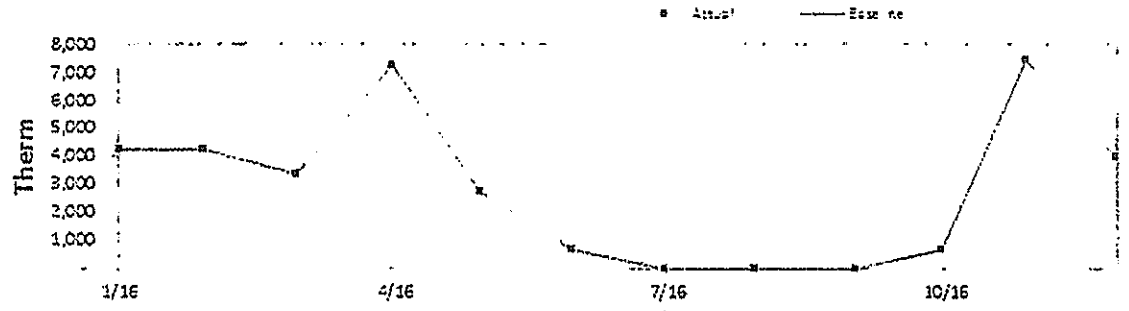
HDD = Heating Degree-Days calculated for CHARLESTONSC for a 60.0 F° balance point.

Multiplier and Offset are derived from Modification(s) in effect during the tuning period and are replicated annually for all future periods.

Meter Tuning Contract

Project: City of Charleston 3
Area: Martin Pk Pool
Account: 0-1975-0107-0930

Site: City of Charleston 3
Meter: Martin Pk Pool NG-0930
Unit: Therm(Qty OnPk)



From	To	# Days	Reading	Incl?	HDD	CDD	Offset	Baseline	Deviation
12/17/15	01/19/16	34	4,257	☒	0.0	0.0	4,257	4,257	0.0%
01/20/16	02/16/16	28	4,259	☒	0.0	0.0	4,259	4,259	0.0%
02/17/16	03/17/16	30	3,405	☒	0.0	0.0	3,405	3,405	0.0%
03/18/16	04/18/16	32	7,246	☒	0.0	0.0	7,246	7,246	0.0%
04/19/16	05/17/16	29	2,767	☒	0.0	0.0	2,767	2,767	0.0%
05/18/16	06/17/16	31	708	☒	0.0	0.0	708	708	0.0%
06/18/16	07/18/16	31	-	☒	0.0	0.0	-	-	0.0%
07/19/16	08/17/16	30	-	☒	0.0	0.0	-	-	0.0%
08/18/16	09/19/16	33	-	☒	0.0	0.0	-	-	0.0%
09/20/16	10/18/16	29	704	☒	0.0	0.0	704	704	0.0%
10/19/16	11/15/16	28	7,443	☒	0.0	0.0	7,443	7,443	0.0%
11/16/16	12/15/16	30	4,009	☒	0.0	0.0	4,009	4,009	0.0%
Sum/Average/Max		365	34,798		0.0	0.0	34,798	34,798	0.0%

Martin Pk Pool NG-0930 (Account # 0-1975-0107-0930): Tuning Period is 365 days from 12/17/2015 until 12/15/2016.

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (Therm) = Offset

The Baseline Equation has a Net Mean Bias of 0%. The underlying regression has a R^2=0

Baseline Costs are calculated using Average Total Cost/Consumption.

Explanations and Assumptions:

☐ (empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

Multiplier and Offset are derived from Modification(s) in effect during the tuning period and are replicated annually for all future periods.

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 11a	52,067 kWh	0 kW	24,073 Therms	0 kGal.

ECM 13 - Window Replacement - ST JULIAN DEVINE

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through a reduction in energy loss from the window system; therefore, the measurement boundary is the window system itself.

Key Parameter	Measurement Frequency	Measurement Description
Pre- and Post-retrofit Linear feet of crack	One-time	Linear feet of crack was measured for the windows. Energy savings are based on the ASHRAE crack method calculations. Determination of air current air leakage rates is based on the following factors: • Linear feet of cracks • Square feet of openings • Stack coefficient • Shield class • Average wind speed • Heating or cooling set point • Average seasonal ambient
Pre- and Post-retrofit Square feet of opening & U-value	One-time	Window area was measured for the existing windows. The pre and post-retrofit U-values for the windows are based on the manufacturer product information.

The following equation is based on the ASHRAE crack method:

Heat loss per hour: = 1.08 x Q x ΔT

Where Q represents the airflow in cubic feet per minute (CFM) and is calculated in the following manner:

$$Q=A\_crack\times\sqrt{(C\_s\ (T\_out-T\_(in\ ))+\ C\_w\ V\text{^}2\ )}$$

In this equation, A represents the crack area in square inches to be reduced. The other values in the equation are standard for these buildings and are based upon shelter class, height, and local wind speed.

C_w = wind coefficient from ASHRAE 16.23; Fundamentals 2013 Table 5 Local Shelter Class (Trees/other buildings)
V = wind speed = 8.8 average mph (typical US)
Cs = stack coefficient from ASHRAE Table 16.23, Table 4 (based on number of floors)

ΔT = temperature difference = Tout – Tin

The total heat loss is calculated as follows:

$$q=\sum 128\_(x=1)\text{^}(total\ \ hours)\ [1.08\times A\_crack\times\sqrt{(C\_s\ \ (T\_out-T\_(in\ ))+\ C\_w\ \ V\text{^}2\ \ )}\times(T\_out-T\_(in\ ))]$$

Insulation Improvement:

Steady-state, one dimensional heat flow through insulation systems (applied to new windows) is governed by Fourier's law:

q = - k·A·dT/dx * Hrs / 1MMBtu

Where:

q = rate of heat flow, Btu/hr

A = cross sectional area normal to heat flow, ft2

k = thermal conductivity of the insulation material, Btu-in/h ft2°F

dT/dx = temperature gradient, °F/in

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured			
	Electric Consumption	Electric Demand	Natural Gas	Water
ECM 13	5,695 kWh	0 kW	0 Therms	0 kGal.

ECM 18 - Distributed Energy Storage - Greenberg Municipal Complex

The savings associated with this ECM will be verified using IPMVP Volume I, EVO 10000 – 1:2012, Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this ECM are generated through reduction in billing capacity (kVA) charges due to improved power factor and peak (kW) shaving; therefore, the measurement boundary is the peak demand (kVA) and power factor component of the monthly electric bill for the Greenberg Complex electric meter (Account# 0-1898-0003-2261).

Key Parameter	Measurement Frequency	Measurement Description

Pre- and Post-retrofit Power Factor	Monthly	Historical monthly billing data for the above-mentioned utility electric meter was collected and analyzed for the baseline period from May-2016 to April-2017. The power factor, demand (kW and kVA) components of the bills were documented as the baseline. Post-retrofit savings associated with the power factor improvement portion of this ECM will be verified by analyzing billing data for the utility electric meter on a monthly basis. The savings guarantee will be assumed met, as per the table below, as long the ratio of kW/kVA is at unity (1) per the monthly bills. The savings will be updated, as per the formula below, only if the ratio for the month is lower than unity (1).
Pre- and Post-retrofit Electric Demand (kVA and kW)	Shadow and DES Meters Ongoing	Historical 15 minute interval electric demand (kVA & kW) data for the above-mentioned utility electric meter was collected and analyzed for the baseline period from 7/1/2016 to 6/30/2017. Post-retrofit savings associated with the peak shaving portion of this EC will be verified by continuously trending 15 minute interval electric demand (kVA & kW) at the new shadow electric meter and on the ESS meter, utilizing the capabilities of existing Metasys BMS.

Calculation Method:

Power Factor Improvement:
A spreadsheet model was developed to calculate charges associated with the demand portion of the bills for the above-mentioned baseline period. The model utilized published rate structure for SCE&G's "020 - Medium General Service" rate code.

Following equation was used to calculate billed demand (kVA) reduction on a monthly basis:

$$kVA_{reduction} = Max(kW_{post}, kW_{pre}) * (\frac{kVA\_post}{kW\_post} - \frac{kVA\_pre}{kW\_pre})$$

$$kVA\_cost\_savings = kVA\_reduction * Demand\_Rate\_(kVA)$$

Where:
kW = Billed electric demand in kW

kVA = Billed electric demand in kVA

$Demand\_Rate\_(kVA)$ = Baseline kVA demand rate (refer to Schedule 2, Section IV)

Following table summarizes calculated monthly benefits based on the spreadsheet model:

Month	Pre-retrofit Demand (kW)	Pre-retrofit Demand (kVA)	Pre-retrofit PF	Post-retrofit PF	Estimated Monthly Benefit
January	431	455	0.947	1.00	$429.15
February	441	465	0.948	1.00	$429.15
March	433	475	0.912	1.00	$751.02
April	445	484	0.919	1.00	$697.38
May	408	456	0.895	1.00	$842.74
June	462	519	0.89	1.00	$1,000.76
July	484	542	0.893	1.00	$1,018.32
August	500	560	0.893	1.00	$1,053.43
September	441	501	0.88	1.00	$1,053.43
October	408	467	0.874	1.00	$1,035.87
November	405	418	0.969	1.00	$743.87
December	423	438	0.966	1.00	$447.04
				Total	**$9,502**

Peak Shaving:
A separate spreadsheet model was used to calculate savings associated with the peak shaving. Since post power factor improvement ECM, apparent power (kVA) component of the billed demand is expected to be same as the real power (kW) component, spreadsheet model utilized historical 15 minute interval real power (kW) data for the baseline period. The model utilized published rate structure for SCE&G's "020 - Medium General Service" rate code.

Following calculations will be performed on a monthly basis using 15-minute interval datasets:

$$Total\_Facility\_Load\ (t) = Shadow\_Meter\_Demand\ (t) + ESS\_Meter\_Demand\ (t)$$

$$kVA_{shaved} = Total\_Facility\_Load\_\max - Shadow\_Meter\_Demand\_Max$$

$$kVA\_cost\_savings = kVA\_shaved\ * Demand\_Rate\_(kVA)$$

Where:

$Shadow\_Meter\_Demand\ (tmax)$ = Maximum 15 minute interval demand in kVA recorded on Shadow meter for the month

Total_Facility_Load_max = highest 15 minute interval Facility Load in kVA calculated for the month

Demand_Rate_(kVA) = Baseline kVA demand rate, refer to Schedule 2, Section IV

The expected savings for this ECM are as follows, at the rates and escalations as noted in Schedule 2, Section IV.

ECM ID	Measured				
	Electric Consumption	**Electric Demand**	**Natural Gas**	**Water**	**Demand Charge**
ECM 18	0 kWh	594 kVA	0 Therms	0 kGal.	$ 23,123

Refer to Exhibit 1 (electronic attachment) for the detailed expected savings calculations for ECM-18.

IV. BASELINE CALCULATIONS AND UTILITY RATES

The unit utility costs for the Baseline period are set forth below as "Base Utility Cost" and shall be used for all calculations made under this Schedule. The Base Utility Cost shall be escalated annually by the actual utility cost escalation but such escalation shall be no less than the mutually agreed "floor" escalation rate of three percent (3.0%).
The Base Utility Cost for each type of utility has been calculated by separating only the variable component of the published utility rates as of August-2017. The following table summarizes Base Utility Costs for the facilities under the scope of this amendment.

Base Utility Costs

Utility Type	Base Utility Cost
Electric Energy	$0.1229 per kWh (003 - Municipal Power Service) $0.0553 per kWh (020 - Medium General Service)
Electric Demand	No Demand Charge (003 - Municipal Power Service) $21.04 per kVA (020 - Medium General Service) $21.04 per kW* (020 - Medium General Service)
Natural Gas	$1.12 per therm
Water-Sewer	$12.05 per kGal

* Post power factor improvement ECM at Greenberg Complex, power factor is expected to be unity (1).
Following table summarizes applicable rate schedules and utility providers for respective facilities under the scope of this amendment.

No	Facility Name	Facility Address	Electric		Natural Gas		Water-Sewer	
			Utility Provider	Rate Schedule	Utility Provider	Rate Schedule	Utility Provider	Rate Schedule
1	CHARLESTON TENNIS CENTER	19 FARMFIELD ST	SCE&G	003 - Municipal Power Service				
2	DANIEL ISLAND POLICE/FIRE	235 SEVEN FARMS RD	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
3	GOVERNORS PARK - Volvo Cars STADIUM	166 SEVEN FARMS RD	SCE&G	003 - Municipal Power Service				
4	Governors Park - Concessions Building		SCE&G	003 - Municipal Power Service				
5	Governors Park - Family Circle Tennis Center		SCE&G	003 - Municipal Power Service				
6	ARCH BUILDING	85 CALHOUN ST	SCE&G	003 - Municipal Power Service				
7	HAZEL PARKER PLAYGROUND	70 EAST BAY ST	SCE&G	003 - Municipal Power Service				
9	BOXING GYM - COMMUNITY CENTER	1099 KING ST	SCE&G	003 - Municipal Power Service				
11	CITY HALL	80 BROAD ST	SCE&G	003 - Municipal Power Service				
12	LEGAL DEPARTMENT	50 BROAD ST	SCE&G	003 - Municipal Power Service				
13	DOCK STREET THEATER	133 CHURCH ST	SCE&G	003 - Municipal Power Service				
14	FINANCE	116 MEETING STREET	SCE&G	003 - Municipal Power Service	SCE&G	033 - Medium General Svc		

No	Facility Name	Facility Address	Electric		Natural Gas		Water-Sewer	
			Utility Provider	Rate Schedule	Utility Provider	Rate Schedule	Utility Provider	Rate Schedule
15	PARKS DEPARTMENT	823 MEETING ST	SCE&G	003 - Municipal Power Service	SCE&G	033 - Medium General Svc		
16	PARKS DEPARTMENT - WAREHOUSE	823 MEETING ST	SCE&G	003 - Municipal Power Service				
17	VRTC - DEAN BUILDING	375 MEETING ST	SCE&G	003 - Municipal Power Service				
18	MOULTRIE PLAYGROUND	41 ASHLEY	SCE&G	003 - Municipal Power Service				
19	OLD SLAVE MART	6 CHALMERS ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
20	PARKING GARAGE - CAMDEN EXCHANGE	47 JOHN ST	SCE&G	003 - Municipal Power Service				
21	PARKING GARAGE - CHARLESTON PLACE	85 HASSELL ST	SCE&G	003 - Municipal Power Service				
22	PARKING GARAGE - CONCORD	1 CUMBERLAND ST	SCE&G	003 - Municipal Power Service				
23	PARKING GARAGE - GAILLARD	32 ALEXANDER	SCE&G	003 - Municipal Power Service				
24	PARKING GARAGE - LIBERTY & ST PHILLIPS	34 ST PHILLIPS	SCE&G	003 - Municipal Power Service				
25	PARKING GARAGE - MAJESTIC SQUARE	211 KING ST	SCE&G	003 - Municipal Power Service				
26	PARKING GARAGE - MARION SQUARE	399 KING ST	SCE&G	003 - Municipal Power Service				
27	PARKING GARAGE – QUEEN ST	Queen ST	SCE&G	003 - Municipal Power Service				
28	PARKING GARAGE - SC AQUARIUM	24 CALHOUN ST	SCE&G	003 - Municipal Power Service				
29	PARKING GARAGE - VRTC	63 MARY ST	SCE&G	003 - Municipal Power Service				
30	PARKING GARAGE - WENTWORTH	81 WENTWORTH ST	SCE&G	003 - Municipal Power Service				
31	SHAW CENTER	22 MARY ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
32	ST JULIAN DEVINE	1 COOPER ST	SCE&G	003 - Municipal Power Service				
33	TIEDEMAN PARK	40 ELIZABETH ST	SCE&G	003 - Municipal Power Service				
34	MALL PARK	68 COLUMBUS ST	SCE&G	003 - Municipal Power Service				
36	MCMAHON PLAYGROUND	55 CLEVELAND ST	SCE&G	003 - Municipal Power Service				
37	CITY ART GALLERY	34 PRIOLEAU ST	SCE&G	003 - Municipal Power Service				
38	PARKING GARAGE - PRIOLEAU & EAST BAY	25 PRIOLEAU ST	SCE&G	003 - Municipal Power Service				
39	HAMPTON PARK - HORTICULTURE OFFICE	30 MARY MURRAY BVLD	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
40	MILFORD ST - CITY STORES (LOGISTICS)	1950 MILFORD ST	SCE&G	003 - Municipal Power Service				
41	PUBLIC SERVICE COMPOUND - CITY GARAGE	2150 MILFORD ST	SCE&G	003 - Municipal Power Service				
41a	Fleet Management	2150 Milford Street	SCE&G	003 - Municipal Power Service				
42	FREDDIE WHALEY COMMUNITY CENTER	1810 DOSHER ST(2St after	SCE&G	003 - Municipal Power Service				

No	Facility Name	Facility Address	Electric		Natural Gas		Water-Sewer	
			Utility Provider	Rate Schedule	Utility Provider	Rate Schedule	Utility Provider	Rate Schedule
		Milford then rt)						
43	CHARLESTON MARITIME CENTER	10 WHARFSIDE ST	SCE&G	003 - Municipal Power Service				
44	ARTHUR W CHRISTOPHER COMMUNITY CENTER	265 FISHBURNE ST	SCE&G	003 - Municipal Power Service	SCE&G	033 - Medium General Svc		
45	HERBERT HASSELL POOL	265 FISHBURNE ST	SCE&G	003 - Municipal Power Service				
46	JOSEPH P RILEY BALLPARK	360 FISHBURNE ST	SCE&G	003 - Municipal Power Service	SCE&G	033 - Medium General Svc		
47	MITCHELL PLAYGROUND	145 FISHBURNE ST	SCE&G	003 - Municipal Power Service				
48	GREENBERG MUNCIPAL COMPLEX	180 LOCKWOOD	SCE&G	020 - Medium General Service				
49	POLICE STATION	180 LOCKWOOD	SCE&G	020 - Medium General Service	SCE&G	031 - Firm General Gas Service		
50	JACK ADAMS TENNIS CENTER - RESTROOMS	CONGRESS ST	SCE&G	003 - Municipal Power Service				
51	JACK ADAMS TENNIS CENTER - SHELTER	CONGRESS ST	SCE&G	003 - Municipal Power Service				
52	MARTIN PARK(4 Streets North of Columbus)	155 JACKSON ST	SCE&G	003 - Municipal Power Service				
53	MLK POOL	155 JACKSON ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service	Charleston Water System	Inside City
54	MLK POOL - POOL HOUSE	155 JACKSON ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service	Charleston Water System	Inside City
55	JIRC - GYM	1088 QUAIL DRIVE	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
56	LOWCOUNTRY SENIOR CENTER	865 RIVERLAND DRIVE	SCE&G	003 - Municipal Power Service				
57	MAYBANK TENNIS CENTER (2 Street N of Harborview)	1880 HOUGHTON DRIVE	SCE&G	003 - Municipal Power Service				
58	MUNICIPAL GOLF COURSE - CLUB HOUSE	2110 MAYBANK HWY	SCE&G	003 - Municipal Power Service				
59	MUNICIPAL GOLF COURSE - STORAGE SHED	2110 MAYBANK HWY	SCE&G	003 - Municipal Power Service				
60	THOMAS JOHNSON Park (WESTCHESTER PARK)	SECESSIONVILLE	SCE&G	003 - Municipal Power Service				
61	ANGEL OAK - GIFT SHOP	3688 ANGLE OAK RD	SCE&G	003 - Municipal Power Service				
64	DEMING PLAYGROUND (Behind SK&C)	5TH AVENUE MARYVILLE	SCE&G	003 - Municipal Power Service				
65	FOREST PARK PLAYGROUND	780 PLAYGROUND RD	SCE&G	003 - Municipal Power Service				
66	LENEVAR PARK	1305 LENEVAR ST	SCE&G	003 - Municipal Power Service				
67	MARY UTSEY (ORANGE GROVE PARK) - PARK HOUSE	1350 ORANGE GROVE RD	SCE&G	003 - Municipal Power Service				
70	WL STEPHENS	780 PLAYGROUND RD	SCE&G	003 - Municipal Power Service	SCE&G	033 - Medium General Svc		

No	Facility Name	Facility Address	Electric		Natural Gas		Water-Sewer	
			Utility Provider	Rate Schedule	Utility Provider	Rate Schedule	Utility Provider	Rate Schedule
71	BEES LANDING REC.(1 rt S of Glenn/McC on BeesF)	1580 Ashley Gardens Blvd.	SCE&G	003 - Municipal Power Service				
72	ORLEANS WOODS (WILLIE GAINS)	1827 TABORWOOD CIRCLE	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
73	FIRE STATION 2 & 3 - OFFICE	262/263 MEETING ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
74	FIRE STATION 6	5 CANNON ST	SCE&G	003 - Municipal Power Service				
75	FIRE STATION 7	1173 FT JOHNSON RD	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
76	FIRE STATION 8	370 HUGER ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
77	FIRE STATION 9	KING ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
78	FIRE STATION 10	SAV HWY 1 NICHOLSON	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
79	FIRE STATION 11	1517 SAVANNAH HWY	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
80	FIRE STATION 12	HWY 171 OLD TOWN RD	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
81	FIRE STATION 13	358 FOLLY RD	SCE&G	003 - Municipal Power Service				
82	FIRE STATION 4 & 15	162 COMING ST	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
83	FIRE STATION 16(rt before 526 Overpass on 61)	81 ASHLEY PLANTATION RD	SCE&G	003 - Municipal Power Service				
84	FIRE STATION 17	1830 BOHICKET RD	Berkeley Co-op					
85	FIRE STATION 18	235 Seven Farms Rd	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
86	FIRE STATION 19	1985 BEES FERRY RD	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		
87	FIRE STATION 20	1006 Pinefield Road	SCE&G	003 - Municipal Power Service				
88	FIRE TOWER - TRAINING FACILITY	2166 MILFORD ST	SCE&G	003 - Municipal Power Service				
89	DMV	180 LOCKWOOD	SCE&G	003 - Municipal Power Service	SCE&G	031 - Firm General Gas Service		

V. PRIMARY OPERATIONS SCHEDULE PRE & POST RETROFIT

The following tables summarize annual operating schedules for the facilities under the scope of this amendment.

Park House: Deming Park

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Forest Park

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Freddie Whaley

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Lenevar Park

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Mall Park

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	OFF		5:00 PM	10:00 PM	OFF		5:00 PM	10:00 PM	OFF		5:00 PM	10:00 PM	OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Martin Park

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	8:00 AM	4:00 PM	8:00 AM	4:00 PM	8:00 AM	4:00 PM	8:00 AM	4:00 PM	8:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: McMahon Playground

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Mitchell Playground

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Mitchell Playground

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Moultrie Playground

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	7:00 AM	6:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Thomas Johnson Park (Westchester Park)

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	10:00 AM	6:00 PM	10:00 AM	6:00 PM	10:00 AM	6:00 PM	10:00 AM	6:00 PM	10:00 AM	6:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Orleans Wood (Willie Gaines Park)

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	10:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

Park House: Hazel Parker Playground, Tiedeman Park, Hampton Park & May Utsey (Orange Grove) Park

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - March	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	
April - May	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
June - August*	8:00 AM	4:00 PM	8:00 AM	4:00 PM	8:00 AM	4:00 PM	8:00 AM	4:00 PM	8:00 AM	4:00 PM	OFF		OFF		OFF	
September - October	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	4:00 PM	7:00 PM	OFF		OFF		OFF	
November - December	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	3:30 PM	6:00 PM	Noon	5:00 PM	OFF		OFF	

** Assumption: Summer season hours - 8:00 AM - 4:00 PM (Monday - Friday)*

Milford Street City Stores (Logistics)

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - December	8:00 AM	5:00 PM	8:00 AM	5:00 PM	8:00 AM	5:00 PM	8:00 AM	5:00 PM	8:00 AM	5:00 PM	OFF		OFF		OFF	

Public Service Compound - City Garage

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - December	8:00 AM	5:00 PM	8:00 AM	5:00 PM	8:00 AM	5:00 PM	8:00 AM	5:00 PM	8:00 AM	5:00 PM	OFF		OFF		OFF	

Fire Stations

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - December	24x7		24x7		24x7		24x7		24x7		24x7		24x7		24x7	

City Hall - Spaces served by Ground Source Heat Pumps

Months	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Holiday	
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
January - December**	6:00 AM	6:00 PM	6:00 AM	6:00 PM	6:00 AM	6:00 PM	6:00 AM	6:00 PM	6:00 AM	6:00 PM	OFF		OFF		OFF	

*** Fresh air dampers will remain closed & supply fans will cycle to maintain unoccupied tempeature setpoints outside of the hours listed above*

*** Ground source heat pumps will be put in occupied mode, outside of the hours listed above, based on the input from respective occupancy sensors*

Notes:

- Summer season (June thru August) schedules for the Park Houses are based on the information collected from the City staff. Schedules for remainder of the year are based on the published hours on the City website.
- No change to HVAC equipment schedules at the Fire Stations is recommended under the scope of this Amendment.
- Un-occupied period heating and cooling setpoints listed below will be maintained during the period listed as "OFF" in the tables above.
- New BMS will maintain operating schedules for the HVAC system as listed in the tables above and temperature setpoints listed in the table below.
- The individual facility occupants are free to operate as they need to operate to serve their communities. However, events outside of these times will not result in a shortfall payment.

The following table summarizes post-retrofit space temperature setpoints during occupied and un-occupied periods. See Exhibit 1, ECM 3a for measured pre-retrofit temperatures and fan run times

Facility	Cooling Mode		Heating Model	
	Occupied	Un-occupied	Occupied	Un-occupied
Park Houses	72°F	78°F	72°F	65°F
Fire Stations	72°F		72°F	
City Hall (Council Chamber)	72°F	74°F	70°F	68°F
Milford Street City Stores (Logistics)	72°F	78°F	72°F	65°F
Public Service Compound - City Garage	72°F	78°F	72°F	65°F

VI. MEASUREMENT & VERIFICATION SERVICES

JCI will provide the M&V Services set forth below in connection with the Assured Performance Guarantee.

1. During the Installation Period, a JCI Performance Assurance Specialist will track Measured Project Benefits. JCI will report the Measured Project Benefits achieved during the Installation Period, as well as any Non-Measured Project Benefits applicable to the Installation Period, to Customer within 60 days of the commencement of the Guarantee Term.

2. Within 60 days of each anniversary of the commencement of the Guarantee Term, JCI will provide Customer with an annual report containing:

    A. an executive overview of the project's performance and Project Benefits achieved to date;

    B. a summary analysis of the Measured Project Benefits accounting; and

    C. depending on the M&V Option, a detailed analysis of the Measured Project Benefits calculations.

3. During the Guarantee Term, a JCI Performance Assurance Specialist will monitor the on-going performance of the Improvement Measures, as specified in this Agreement, to determine whether anticipated Measured Project Benefits are being achieved. In this regard, the Performance Assurance Specialist will periodically assist Customer, on-site or remotely, with respect to the following activities:

    A. review of information furnished by Customer from the facility management system to confirm that control strategies are in place and functioning;

    B. advise Customer's designated personnel of any performance deficiencies based on such information;

    C. coordinate with Customer's designated personnel to address any performance deficiencies that affect the realization of Measured Project Benefits; and

    D. inform Customer of opportunities to further enhance project performance and of opportunities for the implementation of additional Improvement Measures.

4. For specified Improvement Measures, JCI will:

    A. conduct pre and post installation measurements required under this Agreement;

    B. confirm the building management system employs the control strategies and set points specified in this Agreement; and

    C. analyze actual as-built information and adjust the Baseline and/or Measured Project Benefits to conform to actual installation conditions (e.g., final lighting and water benefits calculations will be determined from the as-built information to reflect the actual mix of retrofits encountered during installation).

    D. confirm that the appropriate metering and data points required to track the variables associated with the applicable Improvement Measures' benefits calculation formulas are established; and

E. set up appropriate data capture systems (e.g., trend and totalization data on the facility management system) necessary to track and report Measured Project Benefits for the applicable Improveok.ment Measure.

F. Trend data records maintained in the ordinary course of system operation shall be used and relied upon by Johnson Controls in connection with Project Benefit calculations. Johnson Controls will use commercially reasonable efforts to ensure the integrity of the data collected to calculate the required metrics. In the event data are lost due to equipment failure, power failure or other interruption in data collection, transmission or storage, Johnson Controls will use reasonable engineering methods to estimate the impact of or replace the lost data

5. For specified Improvement Measures utilizing an "Option C" M&V protocol, as well as the DES power factor correction, JCI will:

A. perform periodic facility inspections of all equipment and operations in the facility during the reporting period to identify changes in the static factors from the baseline conditions;

B. measure and record independent variables at the same time as the energy data; and

C. collect and analyze all applicable utility billing invoices on a monthly basis necessary to track and report Measured Project Benefits for the applicable Improvement Measure.

CUSTOMER RESPONSIBILITIES

In order for JCI to perform its obligations under this Agreement with respect to the Work, the Assured Performance Guarantee, and the M&V Services, Customer shall be responsible for:

1. Providing JCI, its subcontractors, and its agents reasonable and safe access to all facilities and properties that are subject to the Work and/or M&V Services;

2. Providing for shut down and scheduling of affected locations during installation, including timely shutdowns of chilled water and hot water systems as needed to accomplish the Work and/or M&V Services;

3. Providing timely reviews and approvals of design submissions, proposed change orders, and other project documents;

4. Providing the following information with respect to the project and project site as soon as practicable following JCI's request:

    a. surveys describing the property, boundaries, topography and reference points for use during construction, including existing service and utility lines;
    b. geotechnical studies describing subsurface conditions, and other surveys describing other latent or concealed physical conditions at the project site;
    c. temporary and permanent easements, zoning and other requirements and encumbrances affecting land use, or necessary to permit the proper design and construction of the project and enable JCI to perform the Work;
    d. a legal description of the project site;
    e. as-built and record drawings of any existing structures at the project site; and environmental studies, reports and impact statement describing the environmental conditions, including hazardous conditions or materials, in existence at the project site.

5. Securing and executing all necessary agreements with adjacent land or property owners that are necessary to enable JCI to perform the Work;

6. Providing assistance to JCI in obtaining any permits, approvals, and licenses that are JCI's responsibility to obtain as set forth in Schedule 1;

7. Obtaining any permits, approvals, and licenses that are necessary for the performance of the Work and are not JCI's responsibility to obtain as set forth in Schedule 1;

8. Properly maintaining, and performing appropriate preventative maintenance on, all equipment and building systems affecting the Assured Performance Guarantee in accordance with manufacturers' standards and specifications;

9. Providing the utility bills, reports, and similar information reasonably necessary for administering JCI's obligations under the Assured Performance Guarantee within five (5) days of Customer receipt and/or generation or JCI's request therefor;

10. Providing all records relating to energy and/or water usage and related maintenance of the premises and relevant equipment requested by JCI;

11. Providing and installing utility sub-meters on all new construction and/or additions built during the Guarantee Term as recommended by JCI or, alternatively, paying JCI's applicable fees for calculating necessary adjustments to the Assured Performance Guarantee as a result of the new construction;

12. Providing and maintaining a dedicated telephone line and/or TCP/IP remote connection to facilitate remote monitoring of relevant equipment;

13. Promptly notifying JCI of any change in use or condition described in Section III of Schedule 2 or any other matter that may impact the Assured Performance Guarantee;

14. Taking all actions reasonably necessary to achieve the Non-Measured Project Benefits;

15. Remove and dispose of existing MLK pool cover.

16. If any equipment under control is changed out, it is the responsibility of the customer to move the controls and controls programming to the new equipment. This includes, but is not limited to, vending machine controls and HVAC controls.

17. Providing Police and Traffic Control support as necessary to facilitate the safe installation of equipment on city buildings including but not limited to temporary street closures.

CUSTOMER RESPONSIBILITIES

In order for JCI to perform its obligations under this Agreement with respect to the Work, the Assured Performance Guarantee, and the M&V Services, Customer shall be responsible for:

1. Providing JCI, its subcontractors, and its agents reasonable and safe access to all facilities and properties that are subject to the Work and/or M&V Services;

2. Providing for shut down and scheduling of affected locations during installation, including timely shutdowns of chilled water and hot water systems as needed to accomplish the Work and/or M&V Services;

3. Providing timely reviews and approvals of design submissions, proposed change orders, and other project documents;

4. Providing the following information with respect to the project and project site as soon as practicable following JCI's request:

    a. surveys describing the property, boundaries, topography and reference points for use during construction, including existing service and utility lines;
    b. geotechnical studies describing subsurface conditions, and other surveys describing other latent or concealed physical conditions at the project site;
    c. temporary and permanent easements, zoning and other requirements and encumbrances affecting land use, or necessary to permit the proper design and construction of the project and enable JCI to perform the Work;
    d. a legal description of the project site;
    e. as-built and record drawings of any existing structures at the project site; and environmental studies, reports and impact statement describing the environmental conditions, including hazardous conditions or materials, in existence at the project site.

5. Securing and executing all necessary agreements with adjacent land or property owners that are necessary to enable JCI to perform the Work;

6. Providing assistance to JCI in obtaining any permits, approvals, and licenses that are JCI's responsibility to obtain as set forth in Schedule 1;

7. Obtaining any permits, approvals, and licenses that are necessary for the performance of the Work and are not JCI's responsibility to obtain as set forth in Schedule 1;

8. Properly maintaining, and performing appropriate preventative maintenance on, all equipment and building systems affecting the Assured Performance Guarantee in accordance with manufacturers' standards and specifications;

9. Providing the utility bills, reports, and similar information reasonably necessary for administering JCI's obligations under the Assured Performance Guarantee within five (5) days of Customer receipt and/or generation or JCI's request therefor;

10. Providing all records relating to energy and/or water usage and related maintenance of the premises and relevant equipment requested by JCI;

11. Providing and installing utility sub-meters on all new construction and/or additions built during the Guarantee Term as recommended by JCI or, alternatively, paying JCI's applicable fees for calculating necessary adjustments to the Assured Performance Guarantee as a result of the new construction;

12. Providing and maintaining a dedicated telephone line and/or TCP/IP remote connection to facilitate remote monitoring of relevant equipment;

13. Promptly notifying JCI of any change in use or condition described in Section III of Schedule 2 or any other matter that may impact the Assured Performance Guarantee;

14. Taking all actions reasonably necessary to achieve the Non-Measured Project Benefits;

15. Remove and dispose of existing MLK pool cover.

16. If any equipment under control is changed out, it is the responsibility of the customer to move the controls and controls programming to the new equipment. This includes, but is not limited to, vending machine controls and HVAC controls.

17. Providing Police and Traffic Control support as necessary to facilitate the safe installation of equipment on city buildings including but not limited to temporary street closures.

PRICE AND PAYMENT TERMS

Customer shall make payments to JCI pursuant to this Schedule 4.

1. *Work*. The price to be paid by Customer for the Work shall be $12,292,977.00. Payments (including payment for materials delivered to JCI and work performed on and off-site) shall be made to JCI as follows:

November 2017	$3,687,893
December 2017	$614,649
January 2018	$614,649
February 2018	$614,649
March 2018	$614,649
April 2018	$430,254
May 2018	$614,649
June 2018	$553,184
July 2018	$614,649
August 2018	$614,649
September 2018	$614,649
October 2018	$614,649
November 2018	$307,324
December 2018	$614,649
January 2019	$368,789
February 2019	$307,324
March 2019	$122,930
April 2019	$122,930
May 2019	$245,859

2. *M&V Services*. The total price for JCI's M&V Services, as detailed on Schedule 2-4 of this Agreement, is $427,128. At the City's request, this amount will be combined with the remaining M&V Services from the previous phases. The total price for JCI's M&V Services for all phases is $853,131. This amount will be paid to JCI in quarterly installments as shown in the following chart. These payments will be due and payable when Customer receives JCI's invoice and in advance of the services JCI is to provide, and shall be made throughout the Guarantee Term.

Contract Year	Total Annual M&V Service for all Phases	Quarterly Payment	Payment Due Date
Installation 9/2017 thru 12/2017	$ -		Paid 1/1/2017
1/2018 thru 12/2018	$ 66,295	$ 16,573.75	1/1/2018; 4/1/2018; 7/1/2018; 10/1/2018
1/2019 thru 3/2019	$ 17,071	$ 17,071	1/1/2019
Year 1 - 2019	$ 59,712	$ 19,904	4/1/2019; 7/1/2019; 10/1/2019
Year 2 - 2020	$ 82,006	$ 20,501	1/1/2020; 4/1/2020; 7/1/2020; 10/1/2020
Year 3 - 2021	$ 84,466	$ 21,116	1/1/2021; 4/1/2021; 7/1/2021; 10/1/2021
Year 4 - 2022	$ 87,000	$ 21,750	1/1/2022; 4/1/2022; 7/1/2022; 10/1/2022
Year 5 - 2023	$ 89,610	$ 22,402	1/1/2023; 4/1/2023; 7/1/2023; 10/1/2023
Year 6 - 2024	$ 32,011	$ 8,003	1/1/2024; 4/1/2024; 7/1/2024; 10/1/2024
Year 7 - 2025	$ 32,971	$ 8,243	1/1/2025; 4/1/2025; 7/1/2025; 10/1/2025
Year 8 - 2026	$ 33,960	$ 8,490	1/1/2026; 4/1/2026; 7/1/2026; 10/1/2026
Year 9 - 2027	$ 34,979	$ 8,745	1/1/2027; 4/1/2027; 7/1/2027; 10/1/2027
Year 10 - 2028	$ 36,029	$ 9,007	1/1/2028; 4/1/2028; 7/1/2028; 10/1/2028
Year 11 - 2029	$ 37,110	$ 9,277	1/1/2029; 4/1/2029; 7/1/2029; 10/1/2029
Year 12 - 2030	$ 38,223	$ 9,556	1/1/2030; 4/1/2030; 7/1/2030; 10/1/2030
Year 13 - 2031	$ 39,369	$ 9,842	1/1/2031; 4/1/2031; 7/1/2031; 10/1/2031
Year 14 - 2032	$ 40,551	$ 10,138	1/1/2032; 4/1/2032; 7/1/2032; 10/1/2032
Year 15 - 2033	$ 41,767	$ 10,442	1/1/2033; 4/1/2033; 7/1/2033; 10/1/2033

3. *Preventative Maintenance Services Agreement*. See Attachment 4 (Preventative Maintenance Services Agreement). The total increase for JCI's Preventative Maintenance Services for Phase III, as detailed on Schedule 2-4 of this Agreement, is $180,526. At the City's request, this amount will be combined with the existing Preventative Maintenance Services. The total price for JCI's Preventative Maintenance Services as outlined in Attachment 4, is $6,493,061. This amount will be paid to JCI in quarterly installments as shown in the following chart. These payments will be due and payable when Customer receives JCI's invoice and in advance of the services JCI is to provide, and shall be made throughout the Service Term.

Contract Year	Total Annual Planned Services for all Phases	Quarterly Payment	Payment Due Date
Installation	$ 314,874	$ 78,719	1/1/2018; 4/1/2018; 7/1/2018; 10/1/2018
Year 1 - 2019	$ 332,180	$ 83,045	1/1/2019; 4/1/2019; 7/1/2019; 10/1/2019
Year 2 - 2020	$ 342,145	$ 85,536	1/1/2020; 4/1/2020; 7/1/2020; 10/1/2020
Year 3 - 2021	$ 352,410	$ 88,102	1/1/2021; 4/1/2021; 7/1/2021; 10/1/2021
Year 4 - 2022	$ 362,982	$ 90,746	1/1/2022; 4/1/2022; 7/1/2022; 10/1/2022
Year 5 - 2023	$ 373,872	$ 93,468	1/1/2023; 4/1/2023; 7/1/2023; 10/1/2023
Year 6 - 2024	$ 385,088	$ 96,272	1/1/2024; 4/1/2024; 7/1/2024; 10/1/2024
Year 7 - 2025	$ 396,640	$ 99,160	1/1/2025; 4/1/2025; 7/1/2025; 10/1/2025
Year 8 - 2026	$ 408,540	$ 102,135	1/1/2026; 4/1/2026; 7/1/2026; 10/1/2026
Year 9 - 2027	$ 420,796	$ 105,199	1/1/2027; 4/1/2027; 7/1/2027; 10/1/2027
Year 10 - 2028	$ 433,420	$ 108,355	1/1/2028; 4/1/2028; 7/1/2028; 10/1/2028
Year 11 - 2029	$ 446,422	$ 111,606	1/1/2029; 4/1/2029; 7/1/2029; 10/1/2029
Year 12 - 2030	$ 459,815	$ 114,954	1/1/2030; 4/1/2030; 7/1/2030; 10/1/2030
Year 13 - 2031	$ 473,609	$ 118,402	1/1/2031; 4/1/2031; 7/1/2031; 10/1/2031
Year 14 - 2032	$ 487,818	$ 121,954	1/1/2032; 4/1/2032; 7/1/2032; 10/1/2032
Year 15 - 2033	$ 502,452	$ 125,613	1/1/2033; 4/1/2033; 7/1/2033; 10/1/2033